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COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
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Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

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COVER: Sorting the catch from a deep-water trawl in March 1955 on the deck of the Service's exploratory fishing vessel Oregon. The vessel has been doing exploratory fishing for deep-water red shrimp and testing long-line fishing for tuna in the Gulf of Mexico (see pp. 45-46 of this issue).

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EXPERIMENTAL FARMING OF THE SOFT-SHELL CLAM, MYA ARENARIA, IN MASSACHUSETTS, 1949-1953

By Osgood R. Smith,* John P. Baptist,* and Edward Chin**

BACKGROUND

The clam-farming experiments which this paper describes were carried out over the years 1949-1953 on the tidal flats of Plum Island Sound, Essex County, Mass., and where noted, in the Hampton River, N. H. The commercially-important clam, Mya arenaria, had been becoming progressively scarcer along the coasts

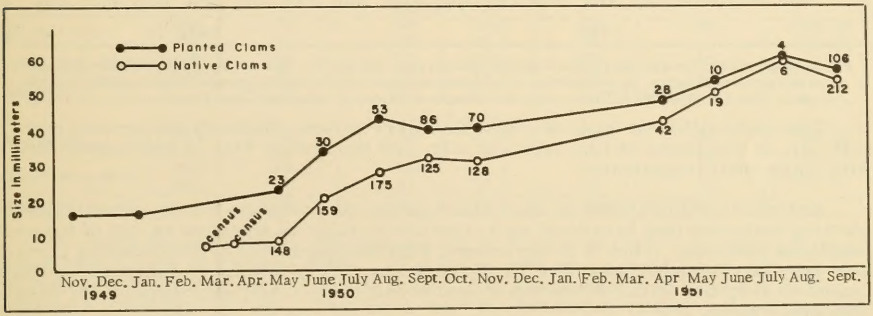

Fig. 1 - Growth of planted and native clams under chicken wire in plot 24B, based on average length from square-foot samples. Numbers of clams per square-foot sample are beside most datum points. Numbers beside points for September 1951 give numbers of clams in eight square feet. Datum point for planted clams in January is from plot 25. Points for native clams in March and April are from "open" flats around plot 24.

of Massachusetts, New Hampshire, and western Maine since about 1940, and it was generally believed that the scarcity was caused by overdigging. If overdigging was the principal cause, it was logical to assume from the work of Mead (1900-1904), Kellogg (1905), and Belding (1930) that clam farming would help to alleviate the shortage. Small clams could be taken from areas closed due to pollution and grown to market size in clean areas. Kellogg and Belding (op. cit.) had demonstrated that clams could be transplanted and that they would survive and grow well enough to produce an increase in volume, so our experiments were designed to learn more about methods and to find out if farming, either by towns or by individuals, would be feasible under present conditions.

TRANSPLANTING METHODS

On May 26 and June 2, 1949, 16 bushels of clams averaging 39 mm. in length[1/] were transplanted in Plum Island Sound at low tide (1) by broadcasting, (2) by plant-

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1/ Shell lengths were measured with vernier calipers to the nearest millimeter, and tabulated in two-millimeter groups, the odd number being combined with the next highest even number (Felin and Phillips 1948).

ing them in plowed furrows, (3) by broadcasting them on roughened ground at high tide, (4) by broadcasting from a boat. All these methods were commonly used by Massachusetts towns in 1949. The clams were planted in concentrations of about 20 and 38 per square foot.

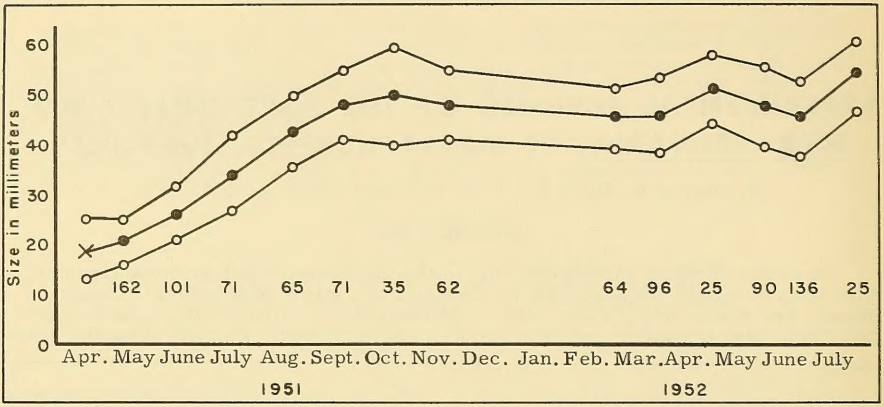

Fig. 2 - Solid points show average growth of planted clams in plots 45B and 60. Open circles above and below averages show one standard deviation. Numbers below datum points are numbers of clams in two square-foot samples from the two plots. The X at lower left is from a volumetric sample of clams just before they were planted.

Two quite different types of clam flats were tested: Hales Cove, a relatively soft flat, is composed of fine sand and silt, and Horseshoe Flat, a hard sandy flat with many shell fragments.

Examination and counts of clam holes in the various plots the day after transplanting indicated that broadcasting at low tide is fully as effective as any of the more laborious methods. This is in agreement with Belding (1930). Broadcasting from a boat may be even more effective for large areas, but in testing this method we were unable to keep the clams within the staked areas so we could not compare the results with other plots.

Within a week after the above plots had been set out, the horseshoe crab (Limulus polyphemus) had concentrated on them and dug up most of the clams. On June 7, 31 horseshoe crabs were found in three 10 x 20-foot plots on Horseshoe Flat, and the entire planted area was covered with depressions. On the softer soil of Hales Cove, the entire surface of the plots had been lowered enough to form square pools

Table 1 - Recoveries of Medium-Size Clams Transplanted August 17,1949, at Average Size of 33 mm. from Fenced Plot (#13)

Date Sampled	Area Sampled	Clams Recovered	Clams Per Sq. Ft.	Avg. Size	Avg. Growth
	Sq. Ft.	No.	No.	mm.	mm.
Aug. 22, 1949	2	52	26.0	-	0
Sept. 19, 1949	2	75	37.5	-	0
July 5, 1950	1	1	1.0	61	27
July 10, 1950	16	62	3.9	58	26
Aug. 30, 1950	16	92	5.8	63	32
Sept. 7, 1950	32	97	3.0	-	-
Oct. 20, 1950	3	19	6.3	62	26
Summary of all 1950 samples:	68	271	4.0	(Survival--about 12.5%)	

of water at low tide. When the Hales Cove plots were dug in November 1949, 92 percent of the clams had disappeared. Field observations and occasional trial digs indicated that most of the loss was caused by horseshoe crabs within a week after the clams were transplanted.

Green crabs (Carcinides maenas) probably dug some of the clams also, but we did not suspect their importance at that time. The principal result of this first series of transplanting experiments was to prove that natural predation was a major problem which would have to be met if clam farming was to be successful.

EXPERIMENTS ON METHODS OF COMBATTING NATURAL PREDATION

After the first transplanting experiments had been eliminated by predators, more plots were set out to test methods of keeping predators away from the clams by the use of fences and screens.

Table 2 - Recoveries of Large Clams Transplanted November 16, 1949, at Average Size of 46 mm. from Fenced and Unprotected Plots

Location	Plot No.	Estimated No. Planted Per Sq. Ft.	Recoveries				
			No. from 4-Sq.-Ft.	No. Per Sq. Ft.	Avg. Size in mm.	Avg. Size of "Planting Ann."	Date Sampled (1950)
Fenced Plots							
Hales Cove	14A	38	100	25.0	57	48	July 18
	15A	21	82	20.5	52	40	July 25
Horseshoe Flat	18A	38	182	45.5	57	44	July 21
	19A	21	85	21.3	55	43	
Summary:		118	449	28.1	(Survival 95%)		
Unprotected Plots							
Hales Cove	16A	38	94	27.0	58	50	July 18
	17A	21	36	9.0	56	41	July 25
Horseshoe Flat	21A	38	60	15.0	58	49	July 21
	20A	21	57	14.3	59	46	
Summary:		118	247	15.4	(Survival 52%)		

The first fenced plot (no. 13) was set out in August of 1949, following the then unpublished work of Turner (1949). This fence, and others built later, was made of 3-foot-wide poultry wire of 2-inch mesh. The lower edge was buried 6 inches, making a fence $2\frac{1}{2}$-feet high. This fence kept out horseshoe crabs, so in November of 1949 two more series of plantings were set out on Horseshoe Flat and Hales Cove, arranged so that fences could be built around some of them the following spring. The clams were of 2 size groups--(1) the larger, dug commercially in Quincy, Mass., averaged 46.2 mm. in length, and (2) the smaller from Scarborough, Me., averaged 16.1 mm.

When these plots were set out, the horseshoe crabs had left the flats for the winter. Most of the green crabs had left and those that remained were nearly dormant. The only predators that seemed likely to attack the clams during the winter were ducks and gulls, because both of these had been seen "puddling" the flats with their feet to wash out small clams, as described by Medcof (1949). Therefore parts of several plots of small clams were covered with one-inch mesh chicken wire staked down flat on the soil soon after the clams had dug in.

Only one small piece of wire about 6 x 6 feet on plot no. 24B remained through the winter, but this one plot, as we shall see later, showed what clams may do where they are well protected.

Examination of tables 1, 2, and 3 will show the results from fenced and unprotected plots of large and small clams, and from a plot of small clams protected by chicken wire staked down over them. The effect of covering planted clams with

chicken wire is further demonstrated by table 4, which shows results of transplanting experiments in 1951 and 1952. These will be discussed in detail later.

Table 3 - Recoveries of Small Clams Transplanted November 18, 1949, at Average Size of 16.1 mm. from Protected and Unprotected Plots

Location and Plot No.	Estimated No. Planted Per Sq. Ft.	Area Sampled (Sq. Ft.)	No. Per Sample	No. Per Sq. Ft.	Average Length in mm.	Average Length of Annulus Formed at Time of Planting	Date Sampled
Protected with Fence							
Hales Cove Plot 14B	216	1	7	7.0	54	22	Oct. 9, 1950
		1	4	4.0	54	21	
		1	7	7.0	54	21	
		5	9	1.8	57	24	Nov. 15, 1950
		7	22	3.1	58	22	
Summary:		15	49	3.3	(Survival--1.5%)		
Protected with Fence							
Hales Cove Plot 15B	108	1	1	1.0	45	18	Oct. 9, 1950
		1	2	2.0	50	20	
		1	1	1.0	57	23	
		16	11	0.7	54	21	Nov. 15, 1950
Summary:		19	15	0.8	(Survival--9.7%)		
Unprotected							
Hales Cove Plot 16B	216	1	0	0	-	-	Oct. 9, 1950
		1	0	0	-	-	
		1	0	0	-	-	
		6	0	0	-	-	Nov. 15, 1950
Unprotected							
Hales Cove Plot 17B	108	1	0	0	-	-	Oct. 9, 1950
		1	0	0	-	-	
		1	0	0	-	-	
		6	0	0	-	-	Nov. 15, 1950
Unprotected							
Hales Cove Plot 23	54	1	6	6	-	-	May 11, 1950
		1	3	3	-	-	June 22, 1950
		1	0	0	-	-	Aug. 9, 1950
		4	0	0	-	-	Nov. 1, 1950
Unprotected							
Hales Cove Plot 24A		1	10	10	-	-	May 11, 1950
		1	0	0	-	-	June 22, 1950
		1	0	0	-	-	Aug. 9, 1950
		1	0	0	-	-	Sept. 20, 1950
		1	0	0	-	-	Nov. 1, 1950
Protected with Chicken Wire for 2 Years							
Hales Cove Plot 24B	108	1	23	23	23.5	-	May 11, 1950
		1	30	30	34.2	-	June 22, 1950
		1	53	53	44.0	-	Aug. 9, 1950
		1	86	86	40.0	-	Sept. 20, 1950
		1	70	70	41.0	-	Nov. 1, 1950
		1	28	28	48.0	-	Apr. 12, 1951
		1	10	10	54.0	-	May 28, 1951
		1	4	4	61.0	-	July 26, 1951
		8	106	13	57.0	-	Sept. 11, 1951
Survival 12%--Sept. 11, 1951							
Protected by Wire Part of Winter, Clammers Dug in Plot							
Hales Cove Plot 25	108	1	20	20.0	16.7	-	Jan. 11, 1950
		1	5	5.0	14.2	-	
		1	30	30.0	24.8	-	May 19, 1950
		½	0	0	-	-	
		4	9	4.5	52.2	-	Sept. 18, 1950
		3	5	1.7	50.4	-	
Protected by Wire Part of Winter							
Horseshoe Flat Plot 26B	108	1	20	20.0	24.7	16.4	May 19, 1950
		1	1	1.0	37.0	19.0	July 5, 1950
Unprotected							
Horseshoe Flat Plot 26A	108	1	2	2.0	28.1	17.8	May 19, 1950
		1	0	0	-	-	July 5, 1950
Unprotected							
Horseshoe Flat Plot 27	108	1	15	15.0	24.9	16.2	May 19, 1950
		1	0	0	-	-	July 5, 1950

It should be explained that the fences kept out horseshoe crabs but not green crabs. By the summer of 1950 we had learned that green crabs, not birds, were

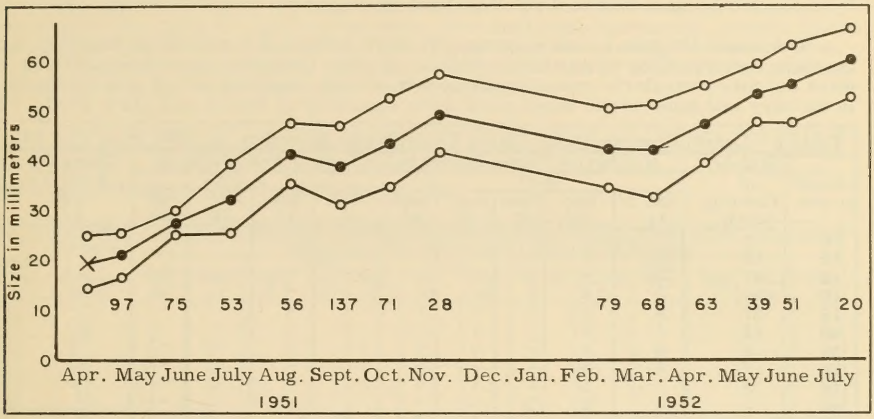

Fig. 3 - Solid points show average growth of planted clams in plot 46. Open circles above and below averages show one standard deviation. Numbers below datum points are numbers of clams in single square-foot samples. The X at lower left is from a volumetric sample of clams just before they were planted.

digging up planted clams inside the fences. During the summer months we had watched the crabs going through and over the fences at high tide, and one crab was caught in the act of devouring a 50 mm. clam.

Table 4 - Recoveries from Protected and Unprotected Plots of Clams in Various Types of Soil (Planted April 17-19, 1951, at Average Length of 19 mm.)

Plot	Est. No. Planted Per Sq. Ft.	Plot Dim. (Ft.)	Number of Planted Clams Recovered in One-Square-Foot Samples												Protection
			1951						1952						
			May 10-11	June 12-13	July 16-17	Aug. 22-27	Sept. 20	Oct. 22	Nov. 23	March 3	March 31	May 1	June 3	June 25	July 30	
Hales Cove--Mod. Soft Fine Sand and Silt															
45A	51	15x15	37	4	0	0	0	0							None
45B	51	15x15	51	50	16	48	54	33	13	51	57	38	26	40	11	Chicken wire
46	104	5x11	162	101	71	65	71	35	62	64	96	25	90	136	25	Chick, wire on frame
47	104	5x11	149	3	0	0	0	0								None
48	104	5x11	71	-	52	2	0		1	(Wire carried away in August)						Chicken wire
Ordway's--Firm Fine Sand and Silt																
60A	51	15x15	42	1	1	0	0	0								None
60B	51	15x15	46	25	37	8	83	38	15	28	11	25	13	11	9	Chicken wire
Rowley "Finger Flat"--Loose Rippled Sand, Low																
49A	51	15x15	9	0	0	0										None
49B	51	15x15	20	0	0	0	(Wire carried away early June)									Chicken wire
Thorofare--Hard Rippled Sand, High																
51A	51	15x15	11	3	1	-	-	2								None
51B	51	15x15	13	3	9	-	-	7								Chicken wire
53A	104	10x10	39	0	0	-	-	3								None
53B	104	10x10	21	21	0	-	-	1								Chicken wire
Dole's Island Bar--Rippled Sand, Low																
54	51	15x15	-	(Clams washed away when planted)												None
Dole's Island Pond--Soft Silt and Detritus, High																
55	51	15x15	-	-	0	0	0									None
Jones Grant, Hampton River, N. H.--Mod. Soft Fine Sand and Silt																
56A	25	15x30	-	-	2										-	None
56B	25	15x30	-	-	13										-	Chicken wire
57A	51	15x15	-	-	4	Wire removed and most of clams dug up by clammers.									0	None
57B	51	15x15	-	-	11										4	Chicken wire
59A	25	15x30	-	-	0										-	None
59B	25	15x30	-	-	(holes seen)										-	Chicken wire

Survival of the planted clams depended on both the size at planting and the degree of protection. Inside a fence, where green crabs could go but horseshoe crabs could not, about 95 percent of the large clams survived for 8 months. With no protection, only about 50 percent of the large clams survived for 8 months (table 2). There was little or no loss of large clams during the winter, but they became thinned out rapidly as soon as the horseshoe and green crabs became active in the spring.

No further work was done with large clams because those available were nearly market size (2 inches) when transplanted, and unless such clams were obtained by cheap mechanical means there would not be any profit in transplanting them.

The small (16 mm.) clams apparently were thinned out soon after planting, but thereafter survived the winter fairly well in all plots (table 3). Screened samples were not taken regularly enough to demonstrate this, but plot no. 25 was sampled in January and most of the other plots were examined in March and April 1950. The

Table 5 - Length Frequencies of Clams Transplanted November 18, 1949, from Plot 24B

Length in mm.	Sample of Planting Stock	Number of Clams Recovered in Square-Foot Samples									Clams from 8 Sq. Ft.
		1950						1951			
		Jan. 1/ 11	May 11	June 22	Aug. 9	Sept. 20	Nov. 1	Apr. 12	May 28	July 26	Sept. 11
10	-	1	-	-	-	-	-	-	-	-	-
12	12	2	1	-	-	-	-	-	-	-	-
14	41	3	-	-	-	-	-	-	-	-	-
16	30	3	4	1	-	-	-	-	-	-	-
18	27	6	1	-	-	-	-	-	-	-	-
20	12	1	1	-	-	-	-	-	-	-	-
22	5	2	2	-	-	-	-	-	-	-	-
24	2	2	3	-	-	-	-	-	-	-	-
26	3	-	5	-	-	-	-	-	-	-	-
28	-	-	2	2	-	-	-	-	-	-	-
30	3	-	1	4	1	3	2	-	-	-	-
32	-	-	-	5	-	3	2	-	-	-	-
34	-	-	2	4	1	4	6	1	-	-	-
36	-	-	1	3	2	11	6	-	1	-	-
38	-	-	-	5	2	11	8	-	-	-	-
40	-	-	-	3	8	19	8	1	-	-	1
42	-	-	-	2	4	11	8	1	-	-	2
44	-	-	-	-	13	9	17	6	1	-	4
46	-	-	-	-	8	7	5	4	1	-	9
48	-	-	-	-	7	2	5	3	1	-	5
50	-	-	-	1	3	2	1	5	1	-	8
52	-	-	-	-	1	2	-	-	-	-	7
54	-	-	-	-	3	1	1	2	-	-	10
56	-	-	-	-	-	1	-	2	-	1	7
58	-	-	-	-	-	-	1	-	1	-	8
60	-	-	-	-	-	-	-	3	1	1	10
62	-	-	-	-	-	-	-	-	-	1	6
64	-	-	-	-	-	-	-	-	1	-	7
66	-	-	-	-	-	-	-	-	-	1	2
68	-	-	-	-	-	-	-	-	2	-	5
70	-	-	-	-	-	-	-	-	-	-	5
72	-	-	-	-	-	-	-	-	-	-	6
74	-	-	-	-	-	-	-	-	-	-	1
76	-	-	-	-	-	-	-	-	-	-	2
78	-	-	-	-	-	-	-	-	-	-	-
80	-	-	-	-	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	1
N	135	20	23	30	53	86	70	28	10	4	106
$\bar{X}$	16.1	16.7	23.5	34.2	43.5	40.1	40.7	48.3	53.9	60.7	56.9
Sx	3.65	3.12	6.08	5.99	4.78	5.19	5.37	5.63	10.25	3.59	16.79

1/ Sample from plot 25, adjacent to plot 24B which was not sampled at this time.

habit which small clams have of coming up out of the soil and moving about (Smith 1953) may account for some of the initial loss. Birds probably were responsible for some of the thinning, but the horseshoe crabs and green crabs were the predators that did the real damage. In March and April clams were still abundant enough in all sampled plots to produce good digging, but they were completely eliminated in most unprotected areas within a few weeks after the horseshoe and green crabs became active in the spring (see the May, June, and July samples in table 3). A few

clams (0.7-1.5 percent) survived inside fences where they could be reached by green crabs but not by horseshoe crabs. So with small clams, the two predators under discussion are about equally bad; if one doesn't eat the clams the other will. Here again the effect of size may be seen. The survivors had annuli, formed at the time of planting, which indicate they were larger than the average for the lot when they were planted (see table 3). An intermediate situation in both size and percentage survival is shown by fenced plot no. 13 (table 1).

The one plot (no. 25) in which a few unprotected clams did survive was on firmly-packed fine sand and silt, near the bank of Plum Island. Unfortunately, clammers dug through this plot sometime during the first winter so we were unable to secure a reliable series of samples from it.

Table 6 - Length Frequencies of Clams Transplanted April 17, 1951, from Plot 45B

Length in mm.	Sample of Planting Stock	Number of Clams Recovered in Square-Foot Samples												
		1951							1952					
		May 10	June 12	July 16	Aug. 22	Sept. 20	Oct. 22	Nov. 23	March 3	March 31	May 1	June 3	June 25	July 30
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	34	-	-	-	-	-	-	-	-	-	-	-	-	-
14	103	2	-	-	-	-	-	-	-	-	-	-	-	-
16	151	3	1	-	-	-	-	-	-	-	-	-	-	-
18	152	10	4	-	-	-	-	-	-	-	-	-	-	-
20	115	14	1	-	-	-	-	-	-	-	-	-	-	-
22	83	14	7	1	-	-	-	-	-	-	-	-	-	-
24	53	2	10	-	-	-	-	-	-	-	-	-	-	-
26	25	2	10	-	1	1	-	-	-	1	-	-	-	-
28	22	-	7	1	-	1	-	-	1	2	-	-	-	-
30	19	2	3	2	-	1	1	-	4	2	-	-	-	-
32	8	-	2	5	2	2	1	-	3	5	1	-	-	-
34	4	1	1	2	4	3	-	-	1	5	1	-	-	-
36	5	1	2	1	5	6	2	-	-	2	1	-	1	-
38	3	-	1	3	5	8	4	2	7	3	1	-	1	-
40	3	-	-	-	6	3	2	-	10	7	4	1	-	-
42	2	-	-	-	5	5	1	1	4	4	4	1	-	-
44	-	-	-	-	5	2	3	-	2	1	3	-	2	-
46	1	-	-	-	9	3	2	-	3	8	4	4	2	2
48	2	-	1	1	3	5	2	3	4	6	4	2	3	-
50	-	-	-	-	-	4	3	-	4	5	2	4	3	1
52	-	-	-	-	1	5	3	1	2	2	2	2	5	-
54	-	-	-	-	-	1	5	1	2	-	2	1	2	2
56	-	-	-	-	2	2	-	1	2	2	2	2	6	-
58	-	-	-	-	-	2	1	1	-	-	2	2	5	2
60	-	-	-	-	-	-	2	2	-	2	1	1	4	-
62	-	-	-	-	-	-	-	-	1	-	-	2	2	1
64	-	-	-	-	-	-	-	-	1	-	2	3	3	-
66	-	-	-	-	-	-	1	1	-	-	2	-	1	1
68	-	-	-	-	-	-	-	-	-	-	-	1	-	2
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	785	51	50	16	48	54	33	13	51	57	38	26	40	11
$\bar{X}$	19.45	21	26	33.5	41.4	42.7	46.9	51.4	42.7	42.1	48.3	53.5	54.1	57.3
Sx	5.37	4.27	5.33	5.45	6.09	7.88	8.57	8.4	8.28	7.94	8.71	7.49	6.89	7.75

Expense seems to be the major obstacle to raising clams by protecting them with wire over the flats. These experiments were not on a large enough scale to give adequate production cost figures, but if we assume 1,200 legal clams per bushel (Turner 1950) and 20 clams per square foot, then 60 square feet of flat could produce a bushel. Wire to cover that area would cost around $1.60, and it probably would have to be replaced once, bringing the cost for wire alone to around $3 to $4 a bushel.

Experiments in progress indicate that a small vertical fence with a flange on top may be a satisfactory means of protecting clams from horseshoe crabs and green crabs. According to Dr. P. Korringa of Holland, 2/ the French oyster growers use a fence only 10 inches high (25 to 30 cm.) with a flange on top to protect oyster spat from green crabs. A barrier similar to this was tried in Plum Island Sound in the summer of 1952. This fence acted as a partial barrier, but it was too small and

2/ Unpublished letter from Dr. P. Korringa of the Ruksinstituut voor Visscherijonderzoek Bergen op Zoom, Holland, to John Glude, Chief, Clam Investigations, U. S. Fish and Wildlife Service, Boothbay Harbor, Me.

was eroded badly, so results were not conclusive. A much larger and stronger fence was built in 1953. This fence was built in the shape of a circle, to enclose the largest possible area per unit length and avoid eddy-producing corners. It was 300 feet in circumference, 18 inches high, and the flange was made of 1- by 6-inch boards, each 10 feet long. The boards were lapped instead of butted to simplify construction. The stakes were 2 by 2 inches; a 4-foot stake was driven in the mud at each overlap of the boards and a 3-foot stake driven in between. One-inch mesh chicken wire, 2 feet wide, was stapled on the inside of this wooden structure, and the bottom edge buried about 6 inches. The actual construction took about 15 man-hours, or 3 men one tide and 2 men the next. The fence proved to be very rigid, and probably stronger than necessary.

Table 7 - Length Frequencies of Clams Transplanted April 17, 1951, from Plot 46

Length in mm.	Sample of Planting Stock	Number of Clams Recovered in Square-Foot Samples												
		1951							1952					
		May 10	June 13	July 16	Aug. 22	Sept. 20	Oct. 22	Nov. 23	March 3	March 31	May 1	June 3	June 25	July 30
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	34	-	-	-	-	-	-	-	-	-	-	-	-	-
14	103	7	-	-	-	-	-	-	-	-	-	-	-	-
16	151	25	1	-	-	-	-	-	-	-	-	-	-	-
18	152	43	7	-	-	-	-	-	-	-	-	-	-	-
20	115	27	4	1	-	-	-	-	-	-	-	-	-	-
22	83	28	20	1	-	-	-	-	-	-	-	-	-	-
24	53	9	26	2	-	-	-	-	-	-	-	-	-	-
26	25	6	9	8	-	-	-	-	-	-	-	-	1	-
28	22	5	9	9	1	-	1	-	-	-	-	1	-	-
30	19	5	6	11	-	-	-	-	-	2	-	-	-	-
32	8	4	7	4	2	1	-	-	-	4	-	-	1	-
34	4	1	4	11	5	-	-	1	3	1	-	4	-	-
36	5	1	3	3	6	2	2	1	4	5	-	6	7	-
38	3	-	3	3	6	1	1	2	2	8	1	2	12	-
40	3	1	1	1	7	6	4	1	7	6	-	4	12	-
42	2	-	-	6	8	5	1	4	5	5	2	9	16	-
44	-	-	1	4	9	9	2	5	8	6	3	8	19	1
46	1	-	-	1	5	13	-	10	7	16	2	5	11	2
48	2	-	-	1	3	9	1	11	9	10	-	9	11	3
50	-	-	-	3	7	8	5	8	7	10	2	11	13	5
52	-	-	-	2	-	-	5	8	4	5	3	5	10	1
54	-	-	-	-	2	5	3	2	3	9	4	9	9	2
56	-	-	-	-	3	5	2	2	3	1	2	6	4	4
58	-	-	-	-	1	-	2	4	2	5	2	2	2	2
60	-	-	-	-	-	3	2	1	-	1	2	2	2	-
62	-	-	-	-	-	1	1	2	-	1	1	5	4	3
64	-	-	-	-	-	3	-	-	-	-	-	-	-	-
66	-	-	-	-	-	-	1	-	-	-	1	1	-	1
68	-	-	-	-	-	-	1	-	-	1	-	1	1	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	-	-	-	-	-	-	1	-	-	-	-	-	1	-
74	-	-	-	-	-	-	-	-	-	-	-	-	-	1
76	-	-	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	785	162	101	71	65	71	35	62	64	96	25	90	136	25
$\bar{X}$	19.45	20.5	25.9	34.1	42.7	47.9	50.4	48.3	45.6	46.0	51.7	48.0	46.3	54.2
Sx	5.37	4.65	5.46	7.71	7.02	6.88	9.60	7.14	6.15	7.56	6.96	8.16	7.34	6.90

During the summer of 1953 this fence effectively protected clams from the horseshoe and green crabs, their two worst enemies. Figure 5 shows the flat outside the fence has been completely dug up while the surface inside is still smooth. A baited green-crab trap set inside the fence caught 24 crabs in 24 hours, but only 3 of these were too large to have gone through the meshes of the chicken wire fence. A similar trap outside the fence caught 111 green crabs, and, as is usual in trap samples, very few of the crabs were small. The effectiveness of the fence was also observed by swimming around it with an "Aqualung" at high tide, when the water was about 7 feet deep. Large and medium green crabs were clustered against the fence all around its circumference, averaging about 1 every 2 feet of fence. Some were at the base, some were clinging to the wire, but fully half were clinging to the wire up under the flange. Several small crabs and one large one were found inside. The small ones could have gone through the meshes, or they might have swum over the fence because one was seen in the act of swimming over it. While observing these crabs, it became quite obvious that little ones swim much more than big ones.

No horseshoe crabs were ever found inside the fence. Those seen around the fence usually went off in some other direction after bumping into the wire, apparently no effort being made to get over or under the fence.

Apparently the small crabs that went through and over the fence were not numerous or large enough to do serious damage to the clam crop.

Table 8 - Length Frequencies of Clams Transplanted April 19, 1951, from Plot 60B

Length in mm.	Sample of Planting Stock	Number of Clams Recovered in Square-Foot Samples												
		1951							1952					
		May 11	June 12	July 17	Aug. 27	Sept. 20	Oct. 23	Nov. 26	March 3	March 31	May 1	June 3	June 25	July 30
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	34	-	-	-	-	-	-	-	-	-	-	-	-	-
14	103	3	-	-	-	-	-	-	-	-	-	-	-	-
16	151	5	-	-	-	-	-	-	-	-	-	-	-	-
18	152	10	-	-	-	-	-	-	-	-	-	-	-	-
20	115	6	2	3	-	-	-	-	-	-	-	-	-	-
22	83	7	4	2	-	-	-	-	-	-	-	-	-	-
24	53	8	6	1	-	4	-	-	-	-	-	-	-	-
26	25	2	1	4	-	3	1	-	-	-	-	-	-	-
28	22	1	6	5	-	2	2	-	1	-	-	-	-	-
30	19	4	2	1	-	12	2	-	2	1	-	-	-	-
32	8	-	1	7	-	8	4	-	-	1	-	-	-	-
34	4	-	-	3	1	11	4	1	3	-	1	-	-	-
36	5	-	-	4	-	8	3	1	2	-	1	-	-	-
38	3	-	1	1	1	7	4	1	2	1	2	-	-	-
40	3	-	1	2	2	6	4	-	3	1	3	-	-	-
42	2	-	-	2	1	8	2	1	2	-	-	-	-	-
44	-	-	1	-	1	3	1	-	3	1	3	1	1	-
46	1	-	-	1	-	4	4	2	2	3	4	2	-	-
48	1	-	-	1	-	2	4	1	2	2	5	3	-	-
50	-	-	-	-	2	1	3	3	2	1	3	3	-	-
52	-	-	-	-	-	1	-	-	3	-	-	-	1	1
54	-	-	-	-	-	2	-	2	-	-	2	2	-	-
56	-	-	-	-	-	1	-	2	1	-	-	-	1	-
58	-	-	-	-	-	-	-	-	-	-	1	-	2	1
60	-	-	-	-	-	-	-	-	-	-	-	2	-	-
62	-	-	-	-	-	-	-	1	-	-	-	-	2	2
64	-	-	-	-	-	-	-	-	-	-	-	-	1	1
66	-	-	-	-	-	-	-	-	-	-	-	-	-	2
68	-	-	-	-	-	-	-	-	-	-	-	-	2	-
70	-	-	-	-	-	-	-	-	-	-	-	-	-	1
72	-	-	-	-	-	-	-	-	-	-	-	-	1	1
74	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	785	46	25	37	8	83	38	15	28	11	25	13	11	9
X	19.45	21.0	27.2	32.2	42.3	36.5	38.9	48.1	41.9	42.5	45.5	50.6	60.6	63.7
Sx	5.37	4.36	5.93	5.04	5.24	7.27	6.99	7.73	7.39	6.42	5.75	4.91	7.95	6.15

The fence was not standing long enough to tell just what effect it would have on the native clams, but it protected a small plot of transplanted clams. On July 28, 1953, about a bushel of clams averaging 17 mm. in length were planted, some inside and some outside the fence. Those outside never had a chance. With a face plate we could see green crabs grabbing many of them, and apparently none of them survived more than a few days. Inside the fence the clams dug in well, and a small plot within the fence was well peppered with their holes all summer. A square-foot sample on October 14 had 53 per square feet averaging 24 mm.

We planned to maintain this fence at least one more summer, to learn more about what could be produced by protecting a natural set, but clam diggers dug over the area early in 1954 so that particular fenced plot was abandoned.

Instead of rebuilding the fence, we worked with the towns of Ipswich, Mass., and Hampton, N. H., in helping them build fences similar to ours. Both towns purchased materials and supplied much of the labor. Unfortunately, neither of these fences was successful. The one at Ipswich clogged badly with seaweeds and colonial hydroids and could not be maintained. The one at Hampton stayed up well but it did not save either native or transplanted clams inside. Crab traps set inside and outside the Hampton fence indicated the damage was done by large numbers of crabs just small enough to go through the one-inch mesh. Crab traps fished 24 hours in-

side the fence on July 29, 30, and August 12, took 203, 89, and 93 crabs, respectively. The average widths were 40, 40, and 41 mm. Ninety-one percent of these were under 45 mm. wide, and therefore small enough to get through the meshes of the chicken wire. Control samples outside collected 266, 128, and 176, and the average widths were 47, 48, and 49 mm.

In view of these experiences, further fencing experiments will be done with finer-mesh wire. This should be effective if it can be maintained without clogging or washing too badly.

ATTEMPTS TO PLANT CLAMS SO AS TO AVOID PREDATORS

In April of 1951 another series of plots was set out in Plum Island Sound and in the Hampton River, N. H., to test survival on various types of flats and to get more reliable growth and survival data.

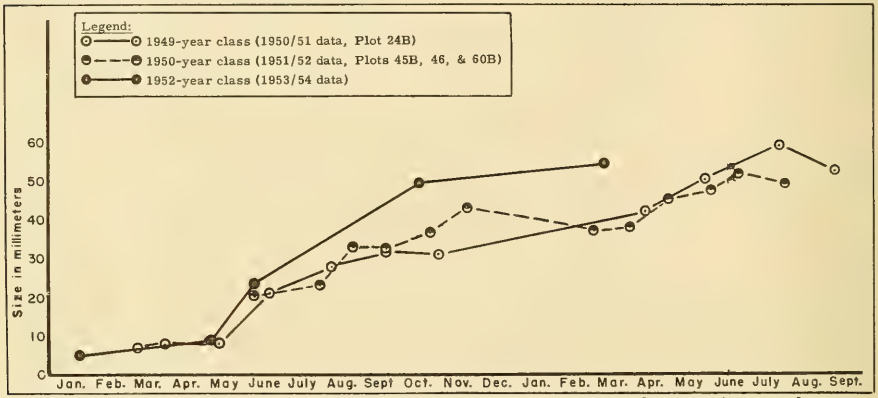

Fig. 4 - Comparative growth of native clams of 1949, 1950, and 1952 year-classes. Data for 1949 and 1950 are from protected plots, there being almost no survival elsewhere. Data for 1952 year-class are from unprotected areas, where clams survived and produced commercial digging, possibly because of more rapid growth.

This plan was adopted because the uneven distribution of native clams in Plum Island Sound, and the results from plot no. 25 mentioned above led us to believe that some areas might be more free of predators than others. Catches of green crabs in traps also indicated that high sandy flats had fewer crabs on them than muddy flats.

The results from these plots of transplanted clams are summarized in Table 4. It may be seen that the results at Hales Cove and Ordways confirmed the results of plot no. 24B (table 3) in showing that clams in those flats survived only where protected.

On the more sandy flats results were confused by the fact that the covering wire was carried away, undermined at the edges, or buried by 3 to 6 inches of shifting sand. Judging by the May samples, many of the clams washed away before they could establish themselves. On one high sandy bar, "Thorofare," the clams that did get established survived longer than in the muddy flats, but survival was not high enough in any unprotected plot to give profitable results.

SURVIVAL OF PROTECTED PLANTED CLAMS

In protected plot 24B, we established the planting density at 108 clams per square foot, and the recovery 2 years later, on a basis of 8 square feet, was 13 clams per square foot or about 12 percent.

In the protected plots 45B, 46, and 60B, survival was estimated from the average of the last four samples and the known concentration when planted. Plots 45B and 60B were each planted with 50 clams per square foot, and the average survival for the two plots combined (i.e., 8 square-foot samples) was 43 percent. Plot 46 planted with 100 per square foot apparently had a 69-percent survival, but the samples from that plot were quite variable. In any case, the clams were extremely crowded over the entire plot, probably too crowded for good growth, so we know survival was relatively high. Plot 46 not only was planted more densely than the others but it also was much better protected. It was covered by chicken wire on a frame, supported 1 inch above the surface of the soil by boards set edgewise in the mud. A few Polinices heros were found under this wire, but it kept green crabs and horseshoe crabs out better than wire that was just staked down. Crabs were sometimes found under the edges of the wire that was staked down.

Table 9 - Length Frequencies of Native Clams from Plot 24B, Chicken Wire-Protected from November 18, 1949 (History of 1949 Year-Class Shown by Figures below the Heavy Lines)

	Number of Clams Recovered in Square-Foot Samples									Clams from 8 Sq. Ft.
	1950					1951				
Length in mm.	May 11	June 22	Aug. 9	Sept.[1] 20	Nov. 1	April 12	May 28	July[2] 26	Sept.[3] 11	Sept. 11, 1951
2	-	-	1	105	149	77	5	6	11	-
4	26	3	30	74	275	457	226	17	89	-
6	31	11	33	48	35	215	164	1	7	-
8	34	26	20	39	16	94	67	1	5	-
10	26	24	32	12	4	30	20	1	-	-
12	17	7	13	18	3	23	7	-	-	-
14	6	9	1	10	1	7	2	-	-	-
16	3	14	1	6	1	5	3	-	-	-
18	4	29	1	1	-	-	7	-	-	-
20	-	23	2	-	3	-	1	-	-	-
22	-	34	3	3	6	-	4	-	-	-
24	-	17	16	7	4	-	-	-	-	-
26	1	12	21	12	20	-	-	-	-	-
28	-	5	31	13	23	1	1	-	-	-
30	-	5	27	19	12	5	-	-	-	-
32	-	3	31	10	18	-	-	-	-	6
34	-	1	14	19	11	6	1	-	-	1
36	-	-	13	28	8	2	1	-	-	1
38	-	-	7	6	11	3	-	-	-	6
40	-	-	5	6	6	2	1	-	-	6
42	-	-	2	-	3	4	1	1	-	8
44	-	-	-	1	1	7	2	-	-	16
46	-	-	-	1	-	2	1	-	-	7
48	-	-	-	-	1	-	1	1	-	18
50	-	-	-	-	-	1	1	-	4	19
52	-	-	-	-	-	1	-	-	1	13
54	-	-	-	-	-	4	-	-	1	15
56	-	-	-	-	-	1	2	-	3	19
58	-	-	-	-	-	2	3	-	1	14
60	-	-	-	-	-	1	-	-	3	16
62	-	-	-	-	-	-	1	-	2	12
64	-	-	-	-	-	-	-	1	1	12
68	-	-	-	-	-	-	1	1	2	7
70	-	-	-	-	-	-	-	-	-	2
72	-	-	-	-	-	-	-	-	-	1
74	-	-	-	-	-	-	-	-	-	3
76	-	-	-	-	-	-	-	-	-	2
78	-	-	-	-	-	-	-	-	-	-
80	-	-	-	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	1
N	148	223	304	438	611	950	525	32	130	212
	Following data from clams below solid line only (growing part of 1949 year-class):									
N	148	159	175	126	127	42	19	6	-	212
$\bar{X}$	8.48	20.77	28.08	31.98	31.04	42.04	50.6	59.33	-	53.51
Sx	3.70	4.60	9.26	4.95	4.80	8.48	11.47	10.39	-	9.64

1/Thirty-two mesh sampler used.
2/Sample probably partly in area previously dug.
3/This is only one of eight square-foot samples taken with fine-mesh screen.
4/Large clams only, including those in previous column.

We do not know what happened to most of the clams that did not survive. Empty shells were found, but not enough to account for all the loss.

Survival was high enough in all protected plots to produce good commercial clam digging. Plot 24B produced about 25 legal clams per square foot, including natives; plot 45B produced about 16; plot 46, 23; plot 60B, about 9. Legal-size native clams were practically absent from the last 3 plots. These figures include only clams over 50 mm., and it may be seen by tables 5 to 10 that many smaller clams were "coming along," so final production would be somewhat greater.

GROWTH OF PLANTED AND NATIVE CLAMS

Transplanted clams usually were distinguishable from natives because their shells were characteristic of the region from which they had come. The clams from Scarborough, Maine, had rather chalky-appearing shells and they tended to be more round than Plum Island Sound clams. The ones from Quincy, Mass., usu-

Table 10 - Combined Length Frequencies of Native Clams from Three Plots (45B, 46, and 60B), Protected (History of 1950 Year-Class is Shown by Figures Below the Solid Lines)

	Number of Clams Recovered in Three Square-Foot Samples												
	1951							1952					
Length in mm.	May 10-11	June 12	July 16-17	Aug. 22-27	Sept. 20	Oct. 22-23	Nov. 23-26	March 3	March 31	May 1	June 3-5	June 25-26	July 30 Aug. 1
2	13	4	5	100	251	146	100	19	28	43	21	-	26
4	295	181	94	339	841	935	435	64	70	524	170	4	122
6	249	93	54	53	27	78	99	33	17	327	74	6	11
8	88	40	15	13	10	7	19	29	27	128	39	8	2
10	48	11	9	4	4	1	-	28	29	58	12	5	1
12	32	-	2	-	3	-	-	16	36	20	8	1	-
14	17	2	1	-	-	1	1	2	10	11	4	3	-
16	8	5	2	-	1	-	-	1	1	20	9	2	-
18	1	8	3	1	1	-	-	2	1	9	3	3	-
20	2	5	6	-	-	-	-	1	-	7	4	2	1
22	3	2	5	2	1	-	-	-	-	-	10	5	-
24	-	-	2	1	2	1	-	-	1	1	6	4	-
26	-	5	1	1	3	2	-	-	-	-	2	6	1
28	-	2	2	-	4	-	1	2	2	-	-	4	1
30	-	1	1	1	2	-	-	1	3	-	1	11	2
32	-	-	1	3	4	2	1	2	3	-	-	4	1
34	-	-	1	-	2	1	-	4	4	-	1	1	1
36	-	-	1	-	6	1	1	2	6	1	1	-	1
38	-	-	1	2	4	2	1	5	3	-	-	1	-
40	-	-	-	4	-	1	1	3	1	-	2	-	2
42	-	-	-	2	2	1	1	5	6	2	1	1	1
44	-	-	-	1	-	-	2	-	2	-	-	1	1
46	-	-	-	-	-	-	2	-	3	1	-	2	-
48	-	-	-	-	-	-	3	-	2	-	2	1	-
50	-	-	-	-	-	1	-	-	2	3	-	-	2
52	-	-	-	-	1	-	1	-	-	-	1	2	2
54	-	-	-	-	-	-	1	-	-	-	-	-	1
56	-	-	-	-	1	-	-	1	-	-	2	2	-
58	-	-	-	-	-	-	-	-	-	-	1	1	-
60	-	-	-	-	-	1	-	-	-	-	-	1	-
62	-	-	-	-	-	-	-	-	-	-	1	1	-
64	-	-	-	-	-	-	-	-	-	-	-	-	-
66	-	-	-	-	-	-	-	-	-	-	-	-	1
68	-	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	1	-
	Following data from clams below solid line[1/] only (growing part of 1950 year-class):												
N	-	30	27	18	34	13	15	25	38	7	12	14	10
$\bar{X}$	-	20.4	23.3	33.4	32.6	36.8	43.1	37.4	38.1	45.1	47.7	52.1	49.0
Sx	-	3.24	6.14	7.95	8.20	9.66	7.00	5.70	6.57	5.02	8.89	6.23	7.54

1/The sample taken in May was not used for average size of the growing group because of the rather extreme dominance of 4 and 6 mm. clams which do not appear to grow.

ally had thick and deformed shells. The shells of native Plum Island Sound clams were generally smooth, slightly glossy, and more pointed posteriorly than either Scarborough or Quincy shells. The new shell, put on as the clams grew after transplanting, was typical of Plum Island Sound shells, and therefore the size at planting or the "planting annulus" could be identified and measured. A few individual clams were difficult to identify, but with these we consulted each other and arrived at a consensus. Annular rings, which form on clam shells much as they do on fish scales,

were not as distinct as the rings formed when the clams were transplanted. Growth was determined from average sizes (lengths) of clams sampled at various times.

In plot 24B clams planted at 16 mm. in November 1949 reached an average size of 57 mm. at the end of the two following summers (fig. 1).

In plots 45B, 46, and 60B clams planted in April 1951 at 19 mm. grew to averages of 54, 57, and 63 mm., respectively, in two summers. Data from plots 45B and 60B have been combined to lessen variability because both were planted at a density of about 50 per square foot and subsequent treatment was the same. Plot 46 was planted with 100 clams per square foot and, as mentioned above, it was better protected (figs. 2 and 3).

Table 11 - Length Frequencies of Native Clams from Hales Cove (History of the 1952 Year-Class is Shown by Figures Below the Solid Lines)

	Number of Clams Recovered from Samples												
	1952								1953				1954
	July 12	July 30	Aug. 15	Aug. 28	Sept. 16	Sept. 29	Oct. 13	Oct. 28	Jan. 26	May 8	June 9	Oct. 14-20	March 11
No. Sq. Ft.	1	1	1	1	1	1	1	1	3	2	4	5-6 [1]	2-20 [2]
Length in mm.													
2	1	4	5	180	63	86	154	38	6	2	3	297	-
4	3	26	24	305	275	306	444	124	30	34	14	706	17
6	-	1	3	10	10	2	10	-	17	28	3	94	16
8	-	-	-	-	1	-	-	-	7	33	-	18	7
10	-	-	-	-	-	-	-	-	1	18	-	6	4
12	-	-	-	-	-	-	-	-	1	11	1	3	4
14	-	-	-	-	-	-	-	-	1	13	1	5	4
16	-	-	-	-	-	-	-	-	-	5	2	1	-
18	-	-	-	-	-	-	-	-	-	15	3	-	-
20	-	-	-	-	-	-	-	-	-	3	4	2	-
22	-	-	-	-	-	-	-	-	-	1	3	-	-
24	-	-	-	-	-	-	-	-	-	-	4	-	2
26	-	-	-	-	-	-	-	-	-	-	6	-	-
28	-	-	-	-	-	-	-	-	-	-	9	-	-
30	-	-	-	-	-	-	-	-	-	-	1	-	-
32	-	-	-	-	-	-	-	-	-	-	1	-	-
34	-	-	-	-	-	-	-	-	-	-	1	1	-
36	-	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-	-	-	-	2	4
42	-	-	-	-	-	-	-	-	-	-	-	7	3
44	-	-	-	-	-	-	-	-	-	-	-	5	8
46	-	-	-	-	-	-	-	-	-	-	-	16	16
48	-	-	-	-	-	-	-	-	-	-	-	6	15
50	-	-	-	-	-	-	-	-	-	-	-	13	22
52	-	-	-	-	-	-	-	-	-	-	-	10	28
54	-	-	-	-	-	-	-	-	-	-	-	6	28
56	-	-	-	-	-	-	-	-	-	-	-	3	20
58	-	-	-	-	-	-	-	-	-	-	-	5	22
60	-	-	-	-	-	-	-	-	-	-	-	1	14
62	-	-	-	-	-	-	-	-	-	-	-	1	5
64	-	-	-	-	-	-	-	-	-	-	-	1	6
66	-	-	-	-	-	-	-	-	-	-	-	1	3
68	-	-	-	-	-	-	-	-	-	-	-	-	1
70	-	-	-	-	-	-	-	-	-	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-	2
74	-	-	-	-	-	-	-	-	-	-	-	-	-
76	-	-	-	-	-	-	-	-	-	-	-	-	2
78	-	-	-	-	-	-	-	-	-	-	-	-	1
80	-	-	-	-	-	-	-	-	-	-	-	-	1
Following data from clams below solid line only (growing part of 1952 year-class):													
N	4	31	32	495	349	394	608	162	63	163	36	78	201
$\bar{X}$	3.5	3.8	3.87	3.31	3.7	3.57	3.85	3.53	5.1	9.3	23.8	49.4	53.8
Sx	4.99	1.39	1.01	1.04	0.9	0.8	0.93	0.8	7.38	4.74	3.99	6.38	7.15

1/ Six square feet sampled, fine mesh (16) used on only 5 square feet.
2/ Two square feet screened with 12-mesh screens. Clams over 24 mm. dug from about 20 square feet.

It may be seen that all growth curves for planted clams show rapid growth in the spring and early summer, and little or no growth in fall and winter. There appears to be a shrinkage of the shell during the winter. This may actually occur, due to erosion or chipping of the edge of the shell, as suggested by Swan (1952). However, we have found that sizes of clams are inversely correlated with the

number of clams per sample and it also happens that most of the points showing departures from a smooth growth curve are similarly associated with either unusually large or unusually small samples (see figs. 1, 2, and 3).

The effect of varying degrees of crowding within one small plot was shown by the 8 separate square-foot samples from plot 24B taken September 11, 1951, as well as by the departures from a smooth growth curve. Clams in the more crowded parts of the plot were distinctly smaller in average size. A correlation between average size and total number of native and planted clams gave a correlation coefficient of -0.8. The differences in size appear to be due to some sort of space relationship rather than lack of food; inasmuch as the square-foot samples adjoined, the entire plot was only 6 x 6 feet, and there were almost no clams in the surrounding flat to remove food from the water flowing over them. The above mentioned samples were as follows:

Number of Clams per square foot -	18	22	23	25	26	32	72	100
Average size of Clams in mm. -	60	55	64	58	60	59	50	51

The chicken wire put down to protect transplanted clams naturally gave some protection to natives. Small clams were sampled by screening the top 3 or 4 inches through 16 x 14 per-inch-mesh screening and the lower soil through 4-per-inch-mesh screening. The largest clams were usually picked by hand.

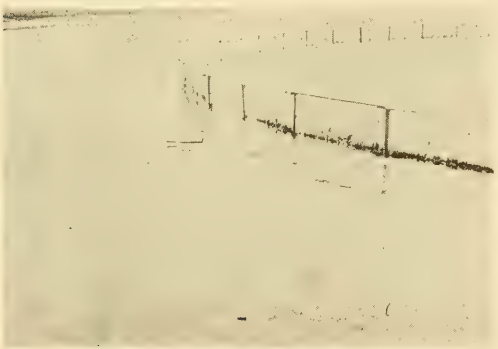

Fig. 5 - Fence built in Plum Island Sound, Newbury, Mass., June 3, 1953, to protect clams from horseshoe and green crabs. The photograph was taken about three weeks after the fence was built. Note that entire flat outside fence is covered with excavations of predators, while the soil inside is still smooth.

The growth of native clams was determined by comparing average lengths of the growing portion of a year class in successive samples. The small clams appearing in the May and June samples were considered to be from the previous summer's spawning because very few clams spawn earlier than May or June (Coe & Turner 1938), and also because the size frequencies of small clams sampled in late fall, winter, and early spring indicate that the May and June crop could belong to the year-class that had been spawned the previous summer. By May these clams are noticeably larger than they were in January, and by June most of the size frequencies are distinctly bi-modal. Of the two groups, the one containing the larger clams is what we have called the "growing portion," because its growth can be traced over at least two years, while the group of smaller clams does not seem to grow. Actually, the apparent lack of growth could be due to movement of the byssus-bearing clams, recruitment, or some change in the predator-prey relationships. Horseshoe crabs and green crabs, becoming active in the spring, might tend to concentrate on clams around 10 to 14 mm. which, if true, could cause the "trough" in the length-frequency curve.

During the summer of 1950 the natives in the only covered plot, no. 24B (table 9 and fig. 1), survived and grew so well that by September of 1951 there was an average of about 16 legal-size natives per square foot. These were clams of the 1949 year-class. Thus, the growth from plankton stage to market size took only three summers, or perhaps a little over two years.

In the three successful plots set out in the spring of 1951, small native clams were present at all times, but comparatively few survived and grew. We do not know why identical treatment produced a good crop one year and very little the next, when there were as many or more young clams. However, by adding the size-frequency data for native clams from these three plots, as in table 10, a growth curve may be derived for the protected natives of the 1950 year-class. Their growth is similar to that of the 1949 year-class (see fig. 4).

In the unprotected plots and the surrounding natural tidal flats, there was practically no survival from the 1949 or 1950 year-class. No data were secured for growth of the 1951 year-class, because no screens were down to protect it, and as with the 1949 and 1950 year-classes, there was practically no survival in the natural flats. There was practically no digging in the area, and none in our plots, so the failure of these crops was not caused by overdigging.

In marked contrast with the foregoing classes, the 1952 year-class survived well enough, even without protection, to produce some reasonably good commercial digging in upper Plum Island Sound. This year-class was not sampled as often nor as thoroughly as the others, but no sampling was needed to recognize its success during the summer of 1953. For the first time in four years the flats became pitted with clam holes, and from 8 to 15 diggers have been working on the Newbury flats almost every day from the fall of 1953 to the fall of 1954. The concentrations varied from 3 or 4 legal-size clams per square foot to about 20 from midsummer on.

The success of the 1952-class seems to have been due to rapid growth. See tables 9, 10, and 11, and figure 4 for a comparison of the 1952 year-class with the 1949 and 1950 year-classes. The larger size of this year-class of clams enabled them to dig deeper and thus be less accessible to predators. The small byssus clams, 12-15 mm. and under, were not unusually abundant during the winter of 1952/53, and as far as we could determine, predators were as abundant as ever. Therefore, we have no evidence that the success of the 1952 clams was due to any changes in the numerical relationships between predators and prey.

CONCLUSIONS

Natural predation on clams up to at least 50 mm. long is a serious problem which will have to be met if clam farming or transplanting is to be economically feasible. Horseshoe crabs and green crabs are the two most serious predators in New Hampshire and northern Massachusetts. Clams can be protected from these predators by covering flats with one-inch mesh chicken wire. In this way both native and transplanted clams can be grown from around 10 or 20 mm. to the market size of 2 inches, or about 50 mm. in two summers. Native clams under about 10 mm. long may or may not survive and grow under the chicken wire. The principal disadvantage of putting chicken wire over the clams is the expense of the wire, which might come to $3 or $4 per bushel of clams. Fences only 10-12 inches high with a flange on top may afford adequate protection and be cheaper per acre, but further experiments are required to demonstrate their successful practical application.

Growth of native clams in areas studied is rapid, from plankton stage to market size generally taking only three summers or perhaps a little over two years. One year-class (1952) grew even faster, producing a commercially-diggable crop in two summers, or a little over one year. This was the first year-class in at least 4 years to survive well enough, without protection, to produce good commercial digging. The success of this year-class and the failure of others, that were just as abundant up through the byssus stage, indicates that fluctuations in clam populations are largely natural in origin and may result from things other than fluctuations in the numbers of juvenile or byssus-stage clams.

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GULF OF MAINE BLUEFIN-TUNA EXPLORATION--1954

By J. J. Murray*

SUMMARY

The California purse seiner Western Pride operated in the New England bluefin tuna fishery from July 28 to September 9, 1954, in a cooperative agreement with the U. S. Fish and Wildlife Service.

Mechanical difficulties, encountered while preparing the seiner for the trip from California to New England, forced postponement of the original departure date and resulted in curtailment of effective fishing time.

Fig. 1 - Western Pride leaving Gloucester, Mass., for fishing grounds, August 1954.

Fishing activities were conducted in the Cape Cod-South Channel area between 41° 38'-42° 08' north latitude and 68° 30'-70° 00' west longitude. Best fishing areas were found 40 nautical miles east southeast of Buoy "R6" of Chatham, Mass., and 10 nautical miles northeast of Race Point, Mass.

A total of 10 purse-seine sets was completed with a catch of 48 tons of bluefin tuna averaging between 30 and 40 pounds a fish. Best fishing occurred on August 21 and 22 when 4 sets in the South Channel netted 32 tons of fish. Tuna schools were sighted on 13 of the 26 days spent at sea. Sizes of schools observed were estimated from 2 to 200 tons with the majority of schools in the 10- to 20-ton class. It was conservatively estimated that over 1,000 tons of tuna were sighted.

Weather conditions prior to hurricane "Carol" on August 31 were generally favorable (with the exception of a few days) for purse-seine fishing, with adverse weather prevailing during the period from September 8 to 18, immediately preceding and following hurricane "Edna" on September 11. Surface water temperatures recorded during August in the vicinity of the fishing grounds ranged from 59° to 65° F.

Considering the short period of fishing time and the unusual weather, the catch of nearly 50 tons of tuna, plus the large number of tuna schools which were seen, is encouraging for commercial utilization of New England tuna, especially if marketing conditions improve for the fishermen.

BACKGROUND

Exploratory fishing for bluefin tuna (Thunnus thynnus) in the Gulf of Maine and adjacent waters has been conducted since 1951 by the Exploratory Fishing and Gear

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Development Section of the U. S. Fish and Wildlife Service. Major objective of the program has been to evaluate the potentiality of this resource and determine the possibility of developing a commercial tuna fishery and canning industry in the region.

The tuna purse seiner Western Explorer, chartered for the initial work during 1951, completed 8 trips with a total catch of 90 tons of tuna (Murray 1952). Operations were continued in 1952 and 1953 using Japanese-style tuna long-line gear as

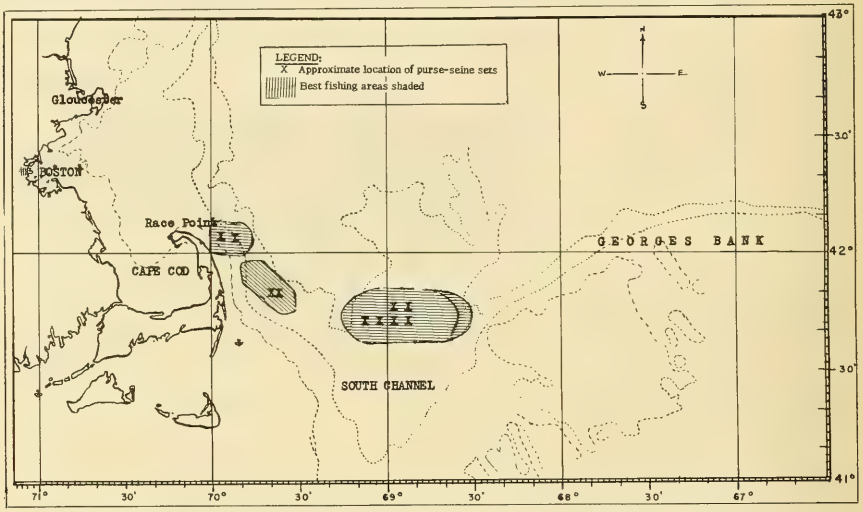

Fig. 2 - Area of bluefin-tuna exploratory fishing operation by M/V Western Pride, 1954.

the principal fishing method. While total production resulting from long-line fishing was low, valuable information relative to locations of tuna schools, extent of range, and oceanographic and meteorological conditions affecting the general availability of the tunas was gathered (Murray 1953 and 1954).

In a cooperative agreement with the owners of the California tuna purse seiner M/V Western Pride, the Service continued to promote commercial development of this fishery during the 1954 season. Tuna-fishing equipment of the Service, consisting of a tuna purse seine, seine skiff, and accessory gear was made available to the vessel operators, who in return supplied the fully-equipped and manned purse seiner and were responsible for all operating costs.

The author served as advisor and observer aboard the Western Pride from July 28 to September 9, 1954, and participated in the scouting and fishing activities for bluefin tuna in the Gulf of Maine and adjacent waters.

VESSEL AND FISHING EQUIPMENT

The M/V Western Pride, a Pacific Coast tuna purse seiner active for many years in the California tuna and pilchard fisheries, departed from San Pedro, Calif., late in June 1954, and stopped at Pascagoula, Miss., where a tuna seine, seine skiff, and accessory gear were taken on board before continuing on to New England waters, arriving off Cape Cod on August 1. Registered measurements of the vessel were: length 71.8 ft.; beam 20.4 ft.; depth 10.6 ft.; tonnage 118 gross tons. The vessel

was powered by a 200-horsepower Diesel engine equipped with a power take-off unit for operation of the purse-seine winch located on deck aft of the deckhouse. Natural ice was carried for preserving the fish catch, with an auxiliary refrigeration unit to maintain fish-hold temperatures at approximately 25° F. Fish-hold capacity was rated at 95 tons.

Fig. 3 - Seine skiff and cork line during set.

A standard Pacific Coast-type tuna purse seine, measuring 377 fathoms in length and 32 fathoms in depth, stretched-mesh measure, was employed. The body of the seine consisted of five horizontal strips of linen webbing (numbers 36 and 40/16), $4\frac{1}{4}$-inches stretched mesh, each strip approximately 377 fathoms in length and 100 meshes deep. A cork-line strip, 8 meshes deep, of No. 60-thread medium-laid cotton seine twine was laced to the top strip of webbing. The lead-line strip, laced to the bottom webbing strip, was of No. 65/12 linen thread, 50 meshes deep, and 8-inches stretched mesh.

A heavy, flat-bottom seine skiff, measuring 26 feet in length and 15 feet in width, equipped with a 100-horsepower gasoline engine was used to assist in fishing operations.

SCOUTING AND FISHING RESULTS

TRIP NO. 1 (July 28-August 12, 1954): The Western Pride departed from Cape May, N. J., en route from California, on July 28 and arrived off Chatham, Mass., on August . Fishing boats operating in this area had reported the presence of tuna schools during the preceding week. Scouting operations

Record of Purse-Seine Sets and Bluefin Tuna Catch of M/V Western Pride, 1954

Date	Position of Set	Est. Size of School	Catch	Surface Temp. (F)	Remarks
		. . . (In Tons) . . .			
8-7	15 Miles Southeast Nauset Light, Cape Cod	5	-	63	Fish sounded out of seine during pursing operation.
8-9	40 Miles East Southeast Chatham Light, Cape Cod	15	-	64	School not encircled due to fouling of cork line during set.
8-10	45 Miles East Southeast Chatham Light, Cape Cod	80	3	65	School surrounded and pursing completed when heavy seas ripped net and caused loss of fish.
8-21	50 Miles Southeast Cape Cod Light, Cape Cod	2	2	65	Perfect set captured small school.
8-21	50 Miles Southeast Cape Cod Light, Cape Cod	15	-	65	Missed school.
8-22	55 Miles Southeast Cape Cod Light, Cape Cod	10	10	65	Perfect set.
8-22	55 Miles Southeast Cape Cod Light, Cape Cod	20	20	65	Perfect set.
8-25	5 Miles Northeast Cape Cod Light, Cape Cod	6	1.5	63	Main body of school sounded before pursing completed.
8-25	5 Miles Northeast Cape Cod Light, Cape Cod	11	11	63	Perfect set.
9-7	40 Miles East Southeast Chatham Light, Cape Cod	2	0.5	59	Small school wild and erratic, main body of school escaped.

during the next four days disclosed many small schools of tuna extending from Pollock Rip Lightship north to Cape Cod Light--a distance of 28 nautical miles. Because of the wild and erratic actions of the schools it was not possible to make any purse-seine sets during this period. On August 7 a school of tuna, estimated to contain 5 tons of fish, was sighted 15 miles southeast of Nauset Light. The seiner went into the set, encircled the school perfectly, but lost it when the fish sounded and escaped from the seine before pursing could be completed. The following day the vessel proceeded offshore in a southeasterly direction where, just before sundown, large schools of tuna were sighted approximately 40 to 50 nautical miles southeast of Cape Cod. The second set, on August 9, was unsuccessful, when a 15-ton school escaped from the seine when the cork line became fouled, causing an excessive delay in closing the purse line. Large schools of tuna were sighted in the South Channel region on the afternoon of August 10. At one time 5 schools estimated to contain from 20 to 50 tons each were surfaced within a radius of 2 miles of the vessel. Weather conditions were poor with heavy seas and winds of 25 knots. Shortly before sundown when the winds and seas moderated, a set was completed and the purse rings were brought on deck with an estimated catch of 80 tons of tuna in the seine.

Fig. 4 - Drying up tuna seines preparatory to brailing.

Soon after pursing the winds increased to near-gale force accompanied by heavy seas. Attempts to split the seine and divide the school into two sections failed due to the excessive rolling of the ship and resulted in tearing the webbing along the cork-line strip, allowing most of the tuna to escape. The seine was finally retrieved 15 hours after setting with a catch of 3 tons of fish that were gilled in the webbing. Extensive damage to the seine and deck gear necessitated a return to port and a loss of eight days' fishing time while the equipment was repaired.

TRIP NO. 2 (August 20-26, 1954): The Western Pride sailed from Gloucester on August 20, completed 5 successful sets in the South Channel fishing grounds, approximately 40 nautical miles southeast of Cape Cod Light, and returned to port on August 26 with a catch of 44.5 tons of bluefin tuna.

Large schools of tuna were sighted within 80 nautical miles of Gloucester . Many of the schools were estimated to contain from 100 to 200 tons of fish, much too large for impounding with the purse seine and equipment available on the Western Pride. Small scattered schools were also found and the first set of the trip on August 21 produced a catch of 2 tons, averaging from 40 to 45 pounds in weight. A second set made later the same day on a school estimated to contain 15 tons of tuna proved unsuccessful. Shortly after sunrise on the following day tuna schools were again sighted and an early morning set caught 10 tons. A few hours before sunset the second successful set of the day was made on a "breezing" school of about 20 tons. After eight hours of work the seine was back on the turntable and the 20 tons of fish had been brailed into the ship's hold. Scouting operations on August 23 did not start until noon, when tuna schools estimated to contain an aggregate of 1,000 tons of tuna were sighted. Attempts to divide the fish into smaller groups by

steaming through the middle of the schools were unsuccessful. Small groups of fish would separate briefly and then rejoin the main school. For three hours the seiner remained in contact with the schools, until they disappeared at dusk, without being able to make a set. High winds and rough seas prevented fishing on the following day, although tuna schools were still observed surfacing over a wide area. On August 25 activities were transferred to the inshore waters between Nauset and Cape Cod Light. Behavior of the schools observed there differed markedly from those further offshore. Inshore fish were generally found in small schools milling and moving erratically and presenting difficult targets for purse seining. Two sets were completed in the area netting a total catch of 12.5 tons of tuna. Average weight of the fish caught in this area was 25 pounds. The trip was unloaded at Gloucester on August 27 and 28.

Fig. 5 - Deckload of New England bluefin tuna.

TRIP NO. 3 (August 29-September 9, 1954): During this period one severe hurricane and the advent of another drastically curtailed fishing and resulted in the loss of the seine skiff and brought a halt to the seining program. On August 30 the Western Pride scouted the inshore Cape Cod waters and found small bunches of tuna. The fish were extremely wild and no sets were possible. Anchorage in Provincetown Harbor was made late that evening. Hurricane "Carol" struck on the morning of August 31 and efforts to keep the vessel from being driven aground were finally rewarded when the storm abated late in the day. Loss of the seine skiff, which foundered during the gale, delayed resumption of fishing while search was made for the missing skiff. The search proved fruitless and loan of a menhaden seine skiff was effected on September 6 and the vessel proceeded offshore to the South Channel. A sharp drop in surface-water temperatures was noted following the hurricane and no large schools of tuna were found in this previously productive area.

Behavior of the smaller-size schools observed resembled actions of the schools in the vicinity of Cape Cod that were sighted on the preceding trip.

A set on September 7 caught 24 fish with a total weight of 1,000 pounds. Evidently the main body of fish had moved further offshore as trawlers fishing on the Northern Edge of Georges Bank, about 40 miles northeast of the South Channel position of the seiner, reported sighting huge schools of tuna in the area. Efforts to reach this position were abandoned when hurricane "Edna" moved up the Atlantic Coast. On September 9 the Western Pride docked at Gloucester completing the final trip of the 1954 season.

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DEVELOPMENT OF VOLUNTARY FEDERAL STANDARDS OF GRADE FOR FRESH AND FROZEN FISHERY PRODUCTS

Voluntary United States Standards are yardsticks with which the quality of a product is measured. They are developed by the Federal Government in cooperation with the producers, processors, distributors, and consumers, and are recommended officially for optional use.

More than 126 United States Standards for processed and fresh food commodities are in effect, and the quantities of foods officially graded amount to billions of pounds. Fresh and frozen fishery products are exceptional in that they do not have voluntary United States Standards of quality as aids to efficient buying and selling.

The grading and inspection programs of the Federal Government have been beneficial to industry and consumers in reducing confusion, waste, and fraud. They have been aids to warehousing, financing, and marketing of foods, and have helped producers and distributors in the development of more and bigger markets; i.e., the uniform improvement of quality of poultry, brought about largely by the U.S. Department of Agriculture poultry inspection and grading service, has resulted in a rapid increase of domestic consumption of broilers and farm chickens from 0.7 billion pounds produced in 1939 to 1½ billion pounds raised in 1952.

At a meeting of the National Fisheries Institute in the spring of 1954, the major producers and distributors of fish sticks requested the U. S. Fish and Wildlife Service to conduct research to develop voluntary standards for fish sticks.

Loading a refrigerated truck with outgoing shipment of fish in Chicago's Fulton Market.

The Saltonstall-Kennedy Act (PL-466) provided funds for a substantial expansion in this project to develop voluntary Federal standards of grade and condition for fresh and frozen fishery products.

The development of background information on the cooked fish sticks has been carried out at the Service's technological laboratories in Boston and in Seattle. Extensive investigations of commercial fish sticks and of experimentally-prepared sticks have been made, including studies of frozen storage of samples. Factors affecting the consumer acceptability of fish sticks have been evaluated and standard descriptive procedures for the grading of the sticks were prepared. Close cooperation with the National Fisheries Institute Fish Stick Committee has been maintained in all of the research conducted. A contract was signed during September 1954 with the National Fisheries Institute to establish industry liaison for Federal-industry joint development and application of the standards.

The Fish Stick Subcommittee has participated with the Service's Technological Section in a joint development of a draft of Proposed Voluntary Standards of Frozen Fried Fish Sticks. The samples of fish sticks collected for the N.F.I. convention product-evaluation session have been graded by technical representatives of industry and Fish and Wildlife Service fishery technological personnel in the East Boston Laboratory, according to the proposed voluntary standards procedures. The proposed voluntary Federal standards have been sent to interested persons of the fish-stick industry for their written comments and suggestions.

Meanwhile, staffs of the Boston and Seattle fishery technological laboratories are continuing to accumulate data and information needed for application of the proposed standards for frozen-prefried breaded fish sticks. They are testing in practice the grading procedures for assessing the quality of the fish sticks. Investigations are also under way to develop objective tests of quality which will supplement the subjective tests in the standard.

The staff of the College Park Laboratory will conduct bacteriological studies and biochemical tests of factors which effect quality of fishery products. It is also coordinating all of the standardization activities of the Service's laboratories and industry, and will maintain liaison with other governmental agencies which have food standardization, inspection, and grading services.

The Service has awarded two research contracts which will be applicable to our standards program. The University of Washington will evaluate the principal tests for freshness in fishery products. The investigation will determine the value of such tests as volatile acids, volatile-reducing substances, trimethylamine, and hydrogen sulfide as indexes of quality. The Massachusetts Institute of Technology will endeavor to develop new objective tests for freshness of fish.

Standardization results from the desire and need of the industry for uniform measures of important variations in quality. The producer desires to get the price that the quality of his product and the condition of the market entitle him. The processor and distributor need the quality grades to facilitate buying and selling. Since the first objective is widest possible uniformity in standardization work, the lead must be taken by the Federal Government. Industry can cooperate by supplying the Federal Government with all the facts concerning the varied condition and practices throughout the producing areas and in the trade in order that they may be evaluated and considered in the development of realistic and practical voluntary standards. The Government standardization agency seeks the advice of producers, processors, distributors, and consumers. It obtains their suggestions and comments in order to reach a complete understanding between the persons involved.

While there are no voluntary Government standards for fishery products, the procedures for the issuance of standards and regulations governing the grading and inspection of them, and the services rendered, are generally those presently in effect for the various commodities, such as poultry. The procedures contemplated are as follows:

The industry shows interest and makes inquiries, and demands voluntary standards. Informal meetings and discussions of views are held, to obtain the over-all picture. Such meetings have been conducted by the Fish Stick Committee of the National Fisheries Institute.

The Federal Government then drafts the proposed standard or regulation, and publishes it, in accordance with the provisions of the Administrative Procedures Act, in the Federal Register, under the title of "Notice of Proposed Rule Making."

A mailing list of interested persons is prepared and letters are sent out requesting written views and arguments regarding the proposed voluntary standard. Industry may present suggestions for changes in the proposed rules, if it wishes.

The suggestions and views are considered by the Administrator and experts of his staff, and certain revisions may be made.

Then a final rule is issued, and the proposed voluntary standards are promulgated in the Federal Register, and become official.

Once the standards are put into effect, any interested person can benefit from their use. Fishermen can use the standards. The quality-conscious packer or processor demands fresh fish of high quality and is willing to pay more for them. A better return for a lesser amount of high-quality fresh fish may be received than for a bigger amount of low-quality fish.

Processors may use the voluntary standards as a basis for contracting with buyers and as a guide to improve packing operations. They may be an aid in financing their operations, and in meeting the ever-increasing demand for foods packed according to definite grade standards.

Distributors can use grade standards to select, for their trade, the grade and factors desired in the contract of purchase. They can maintain uniformity of quality under their brands. Grade information may be carried on their labels for the benefit of consumers, if continuous in-plant inspection has been made by Federal inspectors applying the appropriate grade standards.

Institutional buyers may use the grade standards to fit their purchases to the use for which intended. They may find the standards very useful in drafting specifications to meet their needs, or use the standards as buying specifications.

There are three types of grading and inspection services available:

1. Grading of fresh or chilled fishery products at terminal markets and other points;
2. Grading of processed and manufactured fishery products in official plants, at terminal markets, and other receiving points;
3. Inspection of fishery products in official plants for processing.

Grading service shall be for class, quality, quantity, or condition, and shall be on the basis of United States voluntary standards and grades. However, grading service may be rendered with respect to products bought and sold on the basis of contract specifications. Grading may be on a continuous basis or a seasonal basis.

Inspection service shall be for the determination of the condition, wholesomeness, and fitness for human food of fishery products.

Grading and inspection certificates will be issued covering products graded and inspected and such certificates shall show the class or classes of fishery products,

the quantity contained in the respective lot, and all pertinent information concerning quality, quantity, or condition of the products.

There are two types of grade and inspection marks used to label products. One carries the legend of the U. S. grade of the product and the other contains a statement "Processed and packed under continuous inspection of the Department," in addition to the U. S. grade mark.

The grade labeling must be checked and approved by the Government grading agency, to be sure that there is no misrepresentation as to the contents of the labeled product.

Inspection and grading certificates are documentary evidence of quality and condition to accompany warehouse receipts in financing operations; as proof of quality and condition to accompany sales offers, invoices, and shipping documents; to substantiate quality and condition of deliveries; and as a basis for labeling retail containers. The final certificates are admissible in all courts of the United States as prima facie evidence of the truth of the statements they contain. Applicants who may request inspections are food processors, bankers, brokers, wholesale distributors, retail grocers, warehousing concerns, railroad agencies, and Federal, State, and city purchasing agencies.

Continuous inspection regulations require that a Government inspector be stationed continuously at the processing plant to observe the product from its raw state through every step in the entire process, and to make an inspection of the finished product for quality and condition. The inspector makes certain that the products are prepared and packed under strict standards of cleanliness.

All of the types of inspection and grading services are on a fee basis sufficient only to cover the cost of the services, and are paid to the Government.

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LITERATURE REVIEW OF FACTORS THAT MAY AFFECT PROCESSED FEEDS QUALITY

A literature review of the factors that may affect the quality of processed feeds is now being compiled at the Service's Seattle Fishery Technological Laboratory. This review was undertaken to obtain information that will aid in the development of methods of chemical analysis that will indicate the nutritive value of fish meal.

Based on the present knowledge, none of the component substances in fish meal can be used as a criterion of the nutritive value. It is also not possible to state what effect the various processes used in fish-meal production will have on either the component substances or the over-all nutritive value of the meal.

Thus, before laboratory tests can be developed, information must be obtained as to (1) which of the constituent substances contribute most to the nutritive value of the meal, (2) what is the relationship among them, (3) what effect a change in any one constituent will have on the over-all nutritive value, and (4) what causes these changes in the constituents.

Many workers have studied various aspects of this problem. Consequently, information from these studies is being accumulated, evaluated, and systematized so that the information relative to the various aspects of the problem will be easily available. Furthermore, since the problem is not unique to the fishing industry but exists for the producers of all types of processed feeds, pertinent information concerning other protein feeds is also being included.

Abstract journals being used in the compilation of the review include Chemical Abstracts, starting with volume 21 (1927); Biological Abstracts, starting with volume 1 (1926); Commercial Fisheries Abstracts, starting with volume 1 (1948); and and Food Science Abstracts, starting with volume 22 (1950). In addition, a number of periodicals are being thoroughly covered that were not included by the abstract journals or that were used most often for the publication of articles applying to the various phases of the problem.

The review is divided into 13 parts, and each one of these is further divided into a first section called "Summary," a second section called "Fishery Products," and a third section called "Nonfishery Products."

In each part the summary section gives a general discussion of the abstracts appearing in that part, points out any contradictions among the abstracts, and briefly states some of the problems remaining to be solved.

The topics covered in the review are as follows:

I. Factors that affect the over-all nutritive value of the product
II. Factors that affect the digestibility of the product
III. Effect of raw material on the quality of the product
IV. Protein and its relation to the quality of the product
V. Amino acids and their relation to the biological and nutritive value of the product
VI. Fats, fatty acids, and their relation to the quality of the product
VII. Effect of processing methods on the quality of the product
VIII. Effect of storage on the quality of the product
IX. Keeping quality of the product
X. Biological methods for determining nutritive value and quality of the product
XI. Other analytical determinations
XII. Review articles applying to the problem
XIII. Correlation of methods for determining nutritive value or quality of a product

Resumes of approximately 300 articles have already been prepared; and about 100 more will be abstracted later.

Parts I through IV and Parts VI and VII have been prepared and duplicated. Any articles among those yet to abstracted that are applicable to these parts will be added later. The remaining parts are being compiled at the rate of about one part per week.

The following are the summaries for the parts that have now been completed:

PART I - FACTORS THAT AFFECT THE OVER-ALL NUTRITIVE VALUE OF A PRODUCT

A section on the nutritive value of processed materials is almost redundant. Nearly all of the papers on protein, amino acids, fat, raw material, processing, and storage are applicable in a section dealing with nutritive value. Obviously, it is both undesirable and unnecessary to repeat all of these abstracts in this section. Thus, in most instances, the articles included in Part I deal with generalities or give the results of determinations of the nutritive value of various products.

The vitamin content of a product has an important bearing on its nutritive value. For this reason the effects of processing conditions on the vitamin content of meal and solubles are also included in this section. Riboflavin and vitamin B_{12} are often used to check the vitamin content or a change in the vitamin content due to some variation in the treatment or source of a product. The vitamin B_{12} content of fishery products changes during spoilage. A relationship has been shown between the loss of these vitamins and pH, time, and temperature during processing.

Folic-acid deficiency has been shown to result in poor growth, poor feathering, and a high incidence of perosis in chicks. Inositol plus vitamin E have prevented hock disorder.

The problems of variations in and measurement of nutritive value of a product are not unique to fishery products. Producers of all types of processed feeds are interested in finding ways to make a standard product and laboratory methods to measure the value of a product.

PART II - FACTORS THAT AFFECT THE DIGESTIBILITY OF THE PRODUCT

The digestibility of a product can be affected by both physical and chemical factors. Thus, Part II, on the whole, includes generalized articles that mention the various points that may affect digestibility.

The measurement of digestibility is a problem. The animal used will affect the results and standardizing conditions are often difficult. The digestibility of various feeds have been measured by both in vivo and in vitro methods. Unfortunately, complex animal organisms react differently than enzymatic systems and the in vivo methods do not give the same results as in vitro methods. This indicates that digestability and nutritive value of a feed are not directly related to chemical composition.

PART III - EFFECT OF RAW MATERIAL ON THE QUALITY OF THE PRODUCT

Almost no information is available to determine the effect of raw material on the quality of a meal. There are reports in the literature that compare meals made from different fish, but the meals have not been processed under definite enough conditions to provide definite proof that meals from different species are different. At this stage of our knowledge such facts as whether part or all of the fish is used, the condition of the fish, and the processing are probably more important than the species of the fish.

The condition of the fish may influence both the amino acid and vitamin content of both the meal and stickwater. It has been stated that spoilage of the raw material is accompanied by a change and general decrease in the amino acid content.

A few studies have been done on the effect of storage and preservation of the raw material on the final product. Two groups of workers have stated that storage

of raw fish did not affect the nutritive value of the meal. However, the yield decreased rapidly. The oil content of the fish did not change, but the free fatty acid and color of the oil increased, and the meal contained increasing amounts of oil, thus reducing the free oil recovered. The yield of condensed fish solubles increased, but the nutritive quality deteriorated. For fish stored from 4 to 10 days at 45° F., there were rapid increases in free fatty acids, volatile nitrogen, and loss of protein in the stickwater.

The Norwegians tested the effect of preservatives on the raw fish to be used to make meal and stickwater. They advised that volatile preservatives are advantageous to avoid high concentrations in the stickwater or meal. Nitrite brine and formalin brine were effective. In some experiments the formalin brine was better, but, if open containers were used, the nitrite brine was better. Formalin appeared to be more effective in preventing the decomposition of fat, and nitrite in preventing the decomposition of protein.

The Norwegians have also reported that the stomach contents of summer herring affected the cooking and pressing, and lowered the nutritive quality of the meal. The actual effect on the nutritive value of the finished meal of the feed the fish have been consuming is difficult to check and certainly is a phase that can be postponed until more basic work is done.

However, the effect of the general condition of the fish or waste material is basic and can be determined. The principal difficulty involved in this is that different types of spoilage may have different effects on the finished meal. Thus the conditions of spoilage must be carefully controlled to limit the number of unknown variables to a minimum.

PART IV - PROTEIN AND ITS RELATION TO THE QUALITY OF THE PRODUCT

Protein is among the most important constituents of fish meal, not only from a nutritive standpoint, but also because the cost of a fish meal is based on its protein content. As a result, quite often when experimental work has been started on the nutritional value of fish meal, the protein is the part that has been studied. However, measurement of the nutritional value of protein is difficult, time-consuming, and expensive, whether it be in fish meal, cereals, or a pure protein. At present, the most reliable methods are biological assays using chicks or rats. A number of chemical laboratory methods have been attempted, but none of them has been very successful in getting the same results as that obtained by biological methods.

One of the earlier chemical methods developed was that known as the protein-quality index. This method was developed with the recognition that total protein values alone do not give an accurate indication of the value of protein. To measure the protein-quality index the following protein fractions are determined: copper-precipitated protein, which is intact protein and which decreases as decomposition increases; phosphotungstic acid precipitated protein, which consists of peptones, peptides, and amino acids not precipitated by copper; the crude protein not digested by pepsin, which consists of keratins, denatured proteins, and certain insoluble nitrogen compounds; hot-water-soluble protein, which consists mainly of gelatin. The protein-quality index is the sum of copper-precipitated protein minus the undigestible protein minus 0.6 times the hot-water-soluble protein plus 0.4 times the phosphotungstic-acid precipitate times 100 divided by the total crude protein. This method of protein-quality index was used in one instance to explain why dogfish meals prepared by a wet process had a higher nutritional value than those prepared by a dry process. The dry-process meal contained 8.9 percent more total protein than the wet-process meal. However, the nutritive value of the meal was lower because more decomposition occurred in the dry-process meal and much of the protein went to the amino acid stage or further. A number of analyses of fish meals for protein-

quality index have been reported, although the determination is time-consuming and its correlation with biological value is still in doubt.

Among other laboratory methods used to estimate the value of various protein feeds are the use of enzymatic digestion and acid hydrolysis followed by amino-acid analysis; the rate of liberation of amino acids from the protein by enzymes; the use of dyes to measure quantitatively the acidic and basic groups of protein molecules; microbiological determinations using Tetrahymena geleii W. At present these methods do not give enough information so that they can be substituted for biological methods to determine the nutritional value of protein.

One of the most important phases of the problem of the nutritive value of protein is the effect of processing procedures. There are many reports in the literature on the stages of processing and their effects on fish meal and on other protein feeds. Much of the early work on processing was done when there was very limited knowledge about vitamins and must be evaluated with this fact in mind.

Some of this work on the effect of processing on the nutritive value of fish meals indicated that high temperatures decreased digestibility, biological value, amino-acid content, protein efficiency, and riboflavin. However, it is still difficult to determine whether other factors involved have as much or more effect than the temperature.

Probably the feed material that has had the most study on methods of proper processing is soy protein. Studies of soybean meal have shown that for different reasons both underheating and overheating will affect the nutritive value of the meal. If the meal is underheated, a trypsin inhibitor is not destroyed and the result is poor utilization of the protein. This factor is of no importance in fish-meal production. If the soybean meal is overheated, digestibility and nutritive value decrease.

One of the important factors in heat damage to protein is the Maillard reaction in which the aldehyde group of carbohydrates apparently reacts with amino groups in the protein or amino acid. Although fish meal contains almost no carbohydrate, there is still a possibility that this type of reaction may occur with other aldehydes during processing.

Among processing factors that may affect the nutritive value of the product are: whether the meal is wet-rendered or dry-rendered, the press, the condition of the raw material during drying, and how long the meal may be subjected to a high heat when the drying is almost completed. The effects of storage and the importance of the conditions of storage on the nutritive value of the protein are other factors that may play a part in determining the over-all nutritive value of the meal.

Many of the factors that determine the nutritive value of protein and the importance of various interrelationships are still among the problems to be solved. However, knowledge is increasing, particularly about the amino acids. Enough work has been done on amino acids that is relative to the problem of the quality of fish meal that they will be discussed as a separate subject in Part V (to be released later).

PART VI - FATS, FATTY ACIDS, AND THEIR RELATION TO THE QUALITY OF THE PRODUCT

Many fish meals are prepared from raw materials with a high oil content and a high degree of unsaturation in the oil. Although most of the oil is often removed before the meals are processed, that still present will change during both processing and storage of the meal.

Numerous short-term investigations have been carried out looking into the effect of the condition of oil present in mixed feeds either as the natural oil occurring in fish meal or as added oil. No really comprehensive investigations have been made. Results of what work has been done are often conflicting so that no firm conclusions can be drawn. Following are some of the principal results reported in the literature.

It has been demonstrated that the composition of oil was altered during manufacture of fish meal. The amount of total fatty acids in cold-pressed menhaden oil was much higher than in oil extracted from menhaden meal. In addition there was a lower percentage of saturated fatty acids and a higher iodine number for the unsaturated acids present in the cold-pressed oil. Some work on Norwegian herring was reported in which the fat in the press cake had a higher free fatty-acid content than the pressed oil. Fat in the press cake was clear and easier to extract than the dark fat extracted from the fish meal. In one instance it was suggested that an indication of quality might be obtained from the free fatty-acid content, which is normally about 5 percent of the fat but has been as high as 40 percent in samples with much decomposition. However, whether free fatty-acid content can be used as a criterion of nutritive value is still unknown, although several workers have indicated that the fatty acids may be one of the factors involved.

The reasons for losses of nutritive value for chicks and rats during processing of fish meal have been investigated in experiments where the meals were prepared under controlled conditions. Canadian workers have heated extracted and nonextracted herring meals at 300° F. for 0, 60, 120, and 180 minutes. When these meals were fed to chicks, both of the meals heated for 180 minutes and the unextracted meals heated for 120 minutes caused lowered growth. When the oil was extracted and added to the heated extracted meals that had not lowered growth, the nutritive value for chick growth was decreased. Fresh herring oil did not have this effect.

In the period immediately after the fish meal leaves the drier, the meal begins to heat spontaneously. The temperature of the meal has been shown to increase as much as 125 Fahrenheit degrees in the first 10 to 20 hours after drying. Factors that affect the time and duration of the heating period include the type of meal, fat content, amount of unsaturation of the fat, and moisture content. Peroxide values of extracted fat increased very rapidly during the first 24 hours after processing.

The ether-soluble fractions decrease during storage and one worker has reported that the largest decrease in herring meals was in those that had become most rancid during the drying process. Japanese workers also have reported this decrease in the ether-soluble fraction during storage. The iodine and bromine values decreased and there was little increase in the free fatty acids. None of these results were compared with the results of animal-feeding tests, so that the actual effect on nutritive value is unknown.

In much of the work that has been done on the effect of fat on the nutritive value of products other than fish meals, rats have been the test animals. However, when animal protein concentrates were tested using chicks, it was reported that a high free fatty acid content of the fat was not an indication of the nutritive worth of such products in well-balanced rations for poultry feeding. High rancidity of the fat in the concentrates did not greatly effect the nutritive value when the concentrates were used at 10- to 15-percent levels in the feeds. Other reports have indicated that rancid or oxidized fat fed to rats had lowered nutritive value.

Grains change during storage periods. Free fatty acids and peroxide values increase, the nitrogen soluble in 3 percent sodium chloride decreases, but again the importance of the changes in nutritive values were not checked by animal tests.

It is obvious that the effects of fat, its kind, degree of unsaturation, extent of rancidity, and other changes that may take place in the fat are factors that require additional study to determine their importance in affecting nutritive value and quality of the product. Such knowledge would also help to determine the processing steps necessary to avoid deleterious changes. Particularly needed are more systematic investigations into the nature of the changes which take place in the oils in fish meals during the heating which occurs immediately after manufacture. This heating probably results in the formation of oxidative oil compounds. There is some evidence that these compounds may have a toxic effect. The oils may also combine in some manner with amino acids or proteins, making them less digestible or unavailable to animals; or alternatively, the heating of the oils in the fish meal during curing or storage may, through production of high temperatures, cause alteration or breakdown of amino acids and proteins. While there are hints in the literature that such reactions may take place, no comprehensive investigation to determine just what takes place during this stage of oxidation of fish oils in meals has been made. Such investigations would do much to clarify the nutritional role of fat in fish meal and might result in revealing one of the principal causes of the wide variability in the nutritive value of different fish meals.

PART VII - EFFECT OF PROCESSING METHODS ON THE QUALITY OF THE PRODUCT

In general, research on the effect of processing methods on the quality and nutritive value of fish meal has not been directed to find the basic reason for variations that appear. A survey of the literature shows lack of agreement about the effects of processing methods and the reasons for these effects. Many of the studies that have been reported were done when methods were not available to analyze and when there was little or no knowledge of vitamins, particularly of members of the vitamin B complex. Thus, it is necessary to examine the results of various feeding tests with the thought in mind that when one product was said to be inferior to another, the cause might have been a vitamin or amino-acid deficiency. Considerable stress should be given this factor in the use of the abstracts summarized in this report.

Experiments have usually been conducted on the biological value or digestibility of the meal, and the results are conflicting. Undoubtedly one reason for this is given in a Norwegian paper that states the effect of a drying method can only be determined if meal from the same raw material is prepared simultaneously in different driers. Results at this laboratory are among those that have indicated that there was no great damage to the protein caused by unfavorable drying conditions. However, other reports state that direct heat-dried meals are inferior to vacuum-dried or steam-dried meals. It has also been reported that a greater difference in nutritive value exists between meals from the same species prepared by a different process than between meals from different species prepared by the same process.

Recently two laboratories have reported the effects of processing methods on fish oils. Decreased growth of both chicks and rats resulted when fish oil was heated at 300° F. for 2 hours or was polymerized at 275° C.

Attempts have also been made to check the effect of processing on individual amino acids in fish meals.

Problems of processing protein meals are not peculiar to fishery byproducts. Heat has been shown to damage protein under a variety of conditions, sometimes at temperatures lower than is required for destruction of amino acids. Dry heat, wet heat, the presence of reducing sugars, length of time of processing, temperature of processing, and method of drying are among the factors in processing that have been shown to affect the quality of a product. Soybean meal must be heated at an optimum temperature. If the meal is underheated, a trypsin inhibitor is not destroyed; if the meal is overheated, damage to the protein results. In either case the nutritive value of the meal is decreased.

Experiments on cereal products have sometimes indicated that dry heat is less damaging than wet heat, but in other instances the reverse has been recommended. The factors that change digestibility or availability of amino acids in a product are often the factors that must be determined.

On the protein quality of cottonseed meal recent workers found that a low processing temperature did not always produce high-quality meals. Others have reported that protein efficiency varied with the amount of heat treatment. It has been recommended that cottonseed meal be cooked at a low temperature for a longer time rather than at a higher temperature for a shorter time.

So many factors can cause variations in the nutritive value of a product that one must eliminate as many variables as possible to determine both what factors cause damage and what kind of damage is the most harmful to the quality of the meal. Much of the experimental work has been of the type that has determined the biological value of a particular meal, but has contributed nothing to the reason for this effect, even though at least part of the history of the meal was known. Experiments to determine the fundamental effect of processing still remain to be carried out and this basic work can best be done by working with one variable at a time. When it is known what factors influence quality and how these factors are affected by the stages of processing, then additive results of the damage can be determined. At present, it is still almost impossible to make a meal of good or poor quality at will except for scorching the protein which always reduced its nutritive quality. When variations can be made within reasonable levels basic causes for an inferior meal will have been found and the answers to processing problems will no longer be elusive.

Parts VI and VIII thru XIII of this literature review will be summarized in a subsequent report.

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FEDERAL SPECIFICATIONS FOR FRESH AND FROZEN FISH ISSUED

Federal specifications for fresh and frozen fish, PP-F-381d (September 3, 1954), was recently issued by the General Services Administration. This supersedes Interim Federal Specification PP-F-00381c and Federal Specification PP-F-381c.

Special commodity clauses for waterfoods, clams, and shrimp, covering Defense Department purchases, were also issued recently by the Army Quartermaster Market Center System.

The above specifications and special clauses are effective May 20, 1955, and copies may be obtained without charge from the General Services Administration Regional Offices in Boston, New York, Atlanta, Chicago, Kansas City (Mo.), Dallas, Denver, San Francisco, Los Angeles, Seattle, and Washington, D. C.

Additions to the U. S. Fleet of Fishing Vessels

A total of 31 vessels of 5 net tons and over were assigned first documents as fishing craft during March 1955, according to the U. S. Bureau of Customs. This was 37 vessels less than during the same month of last year--a decrease of 54 percent.

In the Gulf section only 11 vessels were documented for the first time as fishing craft in March as compared with 41 during the same month a year earlier. The Pacific section also had 11 additions, the South Atlantic section 3, the Middle Atlantic and Great Lakes sections each 2, and the New England and Alaska sections each 1.

U. S. Vessels Assigned First Documents as Fishing Craft, March 1955

Section	March		Jan.-March		Total 1954
	1955	1954	1955	1954	
	(Number)				
New England	1	2	6	3	23
Middle Atlantic	2	-	3	-	15
Chesapeake Bay	-	4	9	23	93
South Atlantic	3	6	9	23	119
Gulf	11	41	19	108	313
Pacific	11	11	17	22	117
Great Lakes	2	1	2	3	6
Alaska	1	3	8	7	27
Hawaii	-	-	-	-	1
Puerto Rico	-	-	-	-	2
Unknown	-	-	-	-	1
Total	31	68	73	189	717

Note: Vessels have been assigned to the various sections on the basis of their home port.

During the first quarter of 1955 only 73 vessels were documented for the first time as fishing craft as compared with 189 vessels for the corresponding period in 1954--a decrease of 61 percent.

California

SARDINE FISHING PREDICTED GOOD FOR NEXT SEASON: The southern California sardine industry can expect a good fishery this fall if the same relation between the amount of spawning in the spring and the availability of sardines in the fall continues as during the past three seasons.

Considerable numbers of sardines spawned this spring in the southern California center, reports the Service's South Pacific Fishery Investigations. In March sardine spawning extended as far north as San Pedro and was widespread off San Diego and Ensenada.

A relation seems to exist between the amount of spawning in the southern California center in the spring and the availability of sardines to the southern California fishery in the fall. In 1952 and 1953, when few fish spawned in this center, the fishery took only about 5,000 tons; in 1954 the fishery took over 65,000 tons.

A marked increase in sardine spawning off southern California and adjacent Baja California in the spring of 1954 preceded the encouraging recovery of the southern California sardine fishery in the fall of 1954. The southern California-northern Baja California spawning area and the one off central Baja California are the current major spawning centers. In recent years, particularly in 1952 and 1953, the southern California center decreased markedly in importance; the spawning in this area in 1954 was about 30 times greater than it was in 1953.

These studies are part of a cooperative research effort of the South Pacific Fishery Investigations, the Scripps Institution of Oceanography, the California Department of Fish and Game, Hopkins Marine Station, and California Academy of Sciences. The California Marine Research Committee directs this joint program, which is known as the California Cooperative Oceanic Fisheries Investigations.

* * * * *

$1 MILLION AWARDED FOR MARINE BIOLOGICAL RESEARCH TO SCRIPPS INSTITUTION OF OCEANOGRAPHY: The Rockefeller Foundation has given the University of California $1 million for the support of research in marine biology at the University's Scripps Institution of Oceanography, La Jolla, Calif.

The grant will be expended over an eight-year period. It will be used to strengthen present research projects and initiate new ones. A visiting professorship and four resident professorships will be established in addition to several graduate fellowships and post-doctoral fellowships. Plans also include improvements in laboratory equipment and facilities, and greater use of the University's fleet of five vessels for experimental work on marine plants and animals in the open sea.

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Cruise 55-C-2, Feb. 15-Apr. 19, 1955, of the M/V Ocean Pride.

TUNA TAGGED BY COMMERCIAL CLIPPER "OCEAN PRIDE" (Cruise C-55-2): A total of 1,088 yellowfin, skipjack, and big-eyed tuna were tagged by the chartered commercial tuna clipper Ocean Pride on a two-month's cruise completed at San Diego on April 19 (see table). All fish were tagged with type "G" plastic tubing tags.

Sea-surface temperature observations were made during the entire cruise. The highest water temperature recorded was 85° F., 40 miles SW. of Cape Blanco, Costa Rica. The lowest water temperature recorded was 57° F. at Coronado Islands off Mexico. The fish caught at the Galapagos Islands were taken in surface water temperatures ranging from 77° F. to 80° F., while at Cocos Island and off Costa Rica the surface water temperatures were higher, ranging from 84° F. to 85° F.

Area	Yellowfin	Skipjack	Big-eyed	Total
	(Number of Fish)			
Galapagos Islands	210	694	26	930
Cocos Island	23	81	12	116
Costa Rica	18	22	2	42
Total	251	797	40	1,088

A fish tagged aboard the Ocean Pride was recovered by the same vessel after being at liberty for five days. It was recovered in the same area as released.

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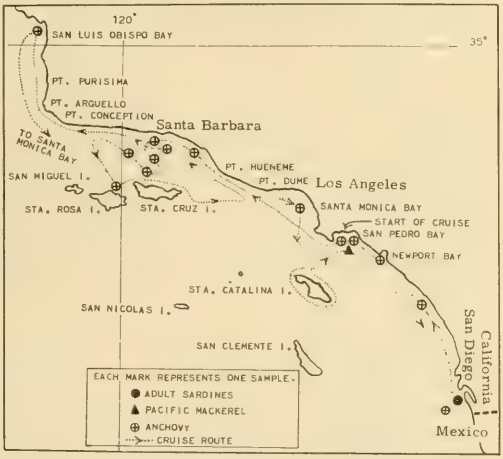
SPRING ABUNDANCE OF SARDINES, ANCHOVIES, AND MACKEREL IN CALIFORNIA WATERS ASSESSED BY "YELLOWFIN" (Cruise 55-Y-2): The first of two 1955 cruises to assess the abundance of sardines, anchovies, and mackerel in California waters during the spring months was completed at Los Angeles on March 21 by the California Department of Fish and Game's research vessel Yellowfin. On the first half of the cruise (which began March 7) preliminary experiments were run on electrofishing with the hope of ultimately obtaining a device which will be of value in collecting fish samples at sea. Although far from conclusive, the preliminary work appeared encouraging.



Cruise 55-Y-2, Mar. 6-21, 1955, of the M/V Yellowfin.

Following experimental work in Los Angeles Harbor, 49 light stations were occupied between San Luis Obispo Bay and San Diego. Hauls with the blanket net resulted in 14 samples of northern anchovy, 1 sample of sardines, and 1 sample of Pacific mackerel. The anchovies were taken over the entire range of the cruise. Sardines were taken in the San Diego area and Pacific mackerel in the Los Angeles Harbor area. In addition to these, the blanket net captured sauries (7 stations), jack smelt (9 stations), top smelt (4 stations), and grunion (7 stations).

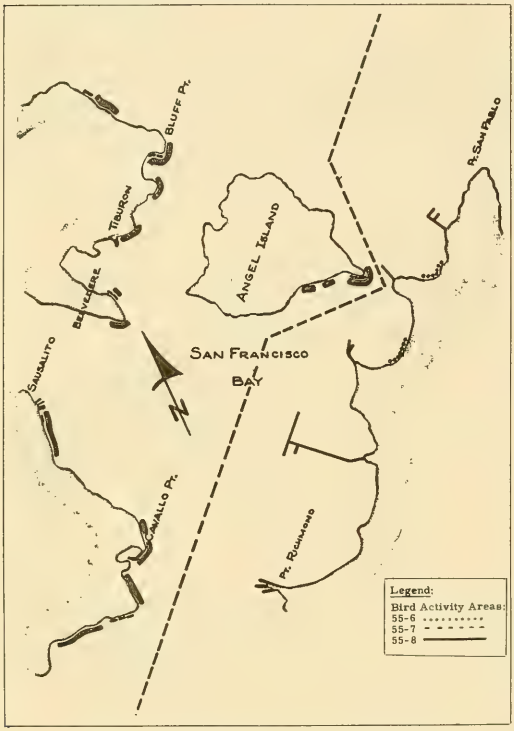
A total of 590 miles were traveled scouting for fish and a total of 141 schools were seen either visually or with the aid of the "Sea Scanar." Of the schools sighted 84 were estimated to be anchovy, 28 saury, and 8 squid. The remaining 21 schools were unidentified though many of these were probably anchovy. The heaviest concentrations of schools were encountered between Port Hueneme and Santa Barbara in the north and between Oceanside and Dana Point in the south. Although no scouting nights were lost, operations throughout the cruise were hampered somewhat by rather heavy swells and during the early part of the cruise by several hours of bright moonlight each night.

Surface temperatures, bathythermograph casts, and reversing thermometer casts were taken at each light station regardless of whether fish were observed or collected in the net.

Surface temperatures encountered on the cruise ranged from 12.1° C. (53.8° F.) at Santa Rosa Island to 15.75° C. (60.4° F.) in Santa Monica Bay. Anchovies were taken at both these temperature extremes. The single sardine sample was taken at a temperature of 14.9° C. (58.8° F.) and the single sample of Pacific mackerel at a temperature of 15.3° C. (59.5° F.).

* * * * *

AERIAL SURVEY OF PACIFIC HERRING SPAWNING INTENSITY CONTINUED (Aircraft Spotting Flights 55-6, 55-7, 55-8, and 55-9): In order to continue the low tide shoreline survey for concentrations of birds feeding on the eggs of the Pacific herring (Clupea pallasi), aerial flights were made along the shore lines of San Francisco, San Pablo, and Tomales Bays by California Department of Fish and Game planes between March 5 and 31. After location of major concentrations of feeding shore birds, the information as to location and extent of spawn was relayed to ground personnel, who then made a spawning intensity check of the area.



Flight 55-6 (March 5): Light concentrations of bird activity were observed in the Richmond-San Pablo area. No activity was observed in the Sausalito or Tomales Bay areas.

Flight 55-7 (March 11): Shorebirds were located west of Golden Gate Bridge approach, also on Belvedere, Bluff Pt. and Angel Is.

Flight 55-8 (March 17): Heavy concentrations of working birds were seen in the Golden Gate Bridge approach, Sausalito, Tiburon, and Angel Is. areas. No activity was observed in Tomales Bay or the San Pablo-Richmond areas.

Flight 55-9 (March 31): No bird activity was sighted.

* * * * *

KELP BASS STUDIES BY "N. B. SCOFIELD" (Cruise 55-S-2): In spite of poor weather conditions that severely hampered fishing and diving work, 154 specimens of kelp bass were secured by the California Department of Fish and Game's research vessel N. B. Scofield and an additional 166 bass were measured and released. However, the weather prevented the collection of barred perch, corbina, and yellowfin and spotfin croakers on the nine-day cruise completed at Los Angeles on April 20. The cruise covered the area off the islands of San Clemente, Santa Catalina, and Santa Cruz, near Santa Barbara and Point Dume.

Part of the bass collection featured the smallest visible sizes which have been unobtainable previously. Diving work revealed that the very small bass were abundant in two locations but could not be netted or taken by size 16 salmon-egg hooks. These small fish would take the hook but the hook could not be set for some reason. The collection was finally affected by a large trap with very small mesh webbing completely covering the wire framework.

Canned Maine Sardine Stocks, April 1, 1955

Distributors' stocks of Maine sardines in the United States are estimated at 331,000 actual cases as of April 1, 1955, according to a recent Bureau of Census survey. Canners' stocks were reported by the Maine sardine industry at 715,000 cases (100 No. ¼ cans) on the same date, states a Bureau of Census release of April 29.

The data on distributors' stocks are based on a probability sample of all wholesalers and warehouses of retail multiunit organizations handling canned foods. Canners' stocks are provided by the Maine Sardine Industry, a canners' association.

Cans--Shipments for Fishery Products, January-February 1955

Total shipments of metal cans for fish and sea food during January-February 1955 amounted to 9,353 short tons of steel (based on the amount of steel consumed in the manufacture of cans), compared to 8,434 short tons in the same period a year earlier.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

Clam Investigations

SOFT-SHELL CLAM SHORTAGE IN NEW ENGLAND DUE TO GREEN CRAB: Work of the U. S. Fish and Wildlife Service's Clam Investigations began during 1948, when soft-shell clams became scarce in New England, supposedly from overdigging. The word "investigation" implies fact-finding, so the research program was designed to provide the facts regarding the clam shortage.

Catch statistics indicated depletion of soft-shell clams in Massachusetts. Production had dropped from 8.4 million pounds of meats in 1940 to 0.6 million pounds in 1948. The number of diggers in Ipswich had dropped 90 percent. A census showed few clams remaining in the flats.

What caused this shortage? Overdigging was blamed. Yet, after 5 years during which only a negligible amount of digging occurred, the clams were still scarce. Seed clams which were planted disappeared in 3 weeks. Yet, if the plots were covered with 1-inch mesh chicken wire, the clams survived and grew well. Therefore, some natural enemy must have eaten the clams.

Further research disclosed three important predators: Polinices, the boring snail; Limulus, the horseshoe crab; and Carcinides, the green crab. The most serious predator north of Cape Cod proved to be the green crab, which is now tremendously abundant. Laboratory experiments showed that each green crab could devour 15 small clams in a day, which explained the failure of unprotected clam farms.

Why should green crabs suddenly become a serious enemy of the soft clams? Records made before 1900 stated that green crabs occurred only south of Cape Cod. From 1905 to 1915 green crabs appeared in Casco Bay, Me. From 1948 to 1953 they were present all along the coast of Maine and even in Canada. From all areas diggers report that these crabs are now more plentiful than ever before in history.

The spread and increase of green crabs may be correlated with warm temperature trends. Average air temperature for the coldest month of winter has increased from 23.6° F. in the 1821-40 period to 28.4° F. in 1941-52 period. This long-term increase in temperature may be responsible for the northward extension of the range of the green crab. Short-term warm cycles such as those from 1923-1933 and 1943-1953 are believed responsible for increased abundance of green crabs and the resulting scarcity of clams. Gulf of Maine water temperatures for the coldest month of the winter averaged 31.9° F. in 1943 but rose to 37.1° F. in 1952.

How can predators be controlled? Green crabs can be trapped easily, but they are so numerous that this method has not yet proved practicable. In one 12-acre cove more than 30,000 crabs were trapped in a month, catching more on the last day than on the first. Low screen fences with a horizontal strip of sheet metal at the top partly protected one clam farm. Chicken wire laid directly over the flats protected the clams but cost $2.75 for each bushel of clams produced. Control by poisoning and by finding enemies of the predators is being investigated, but so far the best bet seems to be a series of cold winters.

--John B. Glude, Fishery Research Biologist,
Clam Investigation, Branch of Fishery Biology,
U. S. Fish and Wildlife Service,
Boothbay Harbor, Me.

Federal Purchases of Fishery Products

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY DEPARTMENT OF DEFENSE, MARCH, 1955: Fresh and frozen fishery products purchases for the military feeding of the U. S. Army, Navy, Marine Corps, and Air Force by the Army Quartermaster Corps in March 1955 amounted to 2.6 million pounds, valued at $1.4 million (table 1). This was an increase of 48.2 percent in quantity and 52.8 percent in value as compared with February purchases, and higher by 90.1 and 80.4 percent, respectively, than in March 1954.

Purchases of Fresh and Frozen Fishery Products by Department of Defense (March and the First Three Months of 1955 and 1954)

QUANTITY				VALUE			
March		Jan.-Mar.		March		Jan.-Mar.	
1955	1954	1955	1954	1955	1954	1955	1954
(Millions of Pounds)				(Millions of Dollars)			
2.6	1.4	6.4	5.1	1.2	.6	2.8	2.2

Army Quartermaster Corps purchases of fresh and frozen fish during the first three months in 1955 totaled 6.4 million pounds (valued at $2.8 million), higher by 25.8 percent in quantity and 23.0 percent in value as compared with the similar period a year earlier.

Prices paid for fresh and frozen fishery products by the Department of Defense in March 1955 averaged 44.2 cents per pound as compared with 42.8 cents in February and 46.5 cents in March 1954.

In addition to the purchases of fresh and frozen fishery products indicated above, the Armed Forces generally make some local purchases which are not included in the above figures. Therefore, actual purchases are somewhat higher than indicated, but it is not possible to obtain data on the local purchases made by military installations throughout the country.

Fishery Products Marketing Prospects, Spring 1955

CONSUMPTION AND RETAIL PRICES: Total supplies of fishery products in the first half of 1955 are likely to be larger than in the same period of 1954, and retail prices a little lower. Civilian per-capita consumption of these products may run a bit higher than in the spring and summer of 1954.

Total supplies of fresh and processed fishery products this spring were expected to continue larger than a year earlier, with the biggest increase in the processed commodities. Retail prices for the fishery products, judging from the Bureau of Labor Statistics wholesale prices in primary markets, were expected to average a little lower than last spring.

FRESH AND FROZEN FISH: More fresh fishery products were expected to be available as landings by commercial fishermen increase seasonally. More of the frozen products--especially haddock and halibut--were expected to be available this spring than last. Cold-storage holdings on April 1 were up 15 percent, and commercial freezings were expected to be expanding seasonally during the next few months. In addition, imports of frozen fish--particularly fillets and blocks--were expected to be at least as large this year as last.

CANNED FISH: Supplies of canned fishery products were larger this spring because of heavier stocks of canned tuna, Maine sardines, and Pacific sardines carried over from last year's packs, as well as the continued heavy imports of canned tuna and frozen tuna for canning. Although very little canned salmon is available at the packers' level, there appears to be a sufficient volume in the other channels of distribution to maintain civilian consumption of this product at about the same per-capita rate as a year ago, at least until the 1955 packs start moving to market in volume after midyear. Production of canned salmon in 1954 was moderately larger than in 1953, but civilian consumption of this product thus far during the 1954/55 marketing season has been at a slightly higher rate than a year earlier.

This analysis appeared in a report prepared by the Agricultural Marketing Service, U. S. Department of Agriculture, in cooperation with the U. S. Fish and Wildlife Service, and published in the former agency's May 2 release of The National Food Situation (NFS-70).

Florida

CRAB-MEAT PACKING SANITATION: The sanitary conditions in fresh crab-meat packing plants is an immediate and pressing problem for the blue-crab industry, according to the January Commercial Fisheries Newsletter #1 of the Marine Laboratory of the University of Miami. This problem of sanitation in crab-meat plants became of particular urgency in the summer of 1953 when several cases of food poisoning, presumably due to crab meat, were reported along the Atlantic Coast. The markets most affected were Baltimore, Philadelphia, and New York City.

The U. S. Food and Drug Administration at the request of New York City authorities sent technicians and inspectors to find the source of the trouble and to establish means of correcting it. As a result of this some shipments of Florida fresh crab meat were embargoed by the Federal Government and a large percentage of meat was condemned. This caused an immediate income loss to the industry, and a far greater loss was represented in the decreasing market for crab meat.

Some producers of crab meat are unfamiliar with procedures used by Federal inspectors, and with the terms used in describing the bacteria and quality standards.

The Federal Government analyzes a small sample of fresh crab meat for the presence of the bacteria Escherichia coli. If these bacteria--usually referred to simply as E. coli--are present, the entire shipment of crab meat is condemned. The crab meat is not condemned solely because of the presence of E. coli itself, but because of what the presence of this organism represents. E. coli is used as an indicator of pollution, since it is an inhabitant of the intestinal tract of man and other animals. When E. coli is found in a food product, including crab meat, it indicates that other filth organisms, for example the typhoid germ, Salmonella typhi, may also be present and may be transmitted to a food product by a person who fails to observe the simple rules of cleanliness.

On July 12, 1954, the New York City Board of Health adopted a resolution which was to take effect January 1, 1955, to amend the Crab Meat Regulation of their health code. Before crab meat is acceptable in New York City, under the new resolution, it must fall in to one of two groups. The first group is crab meat which has been packed in a hermetically-sealed container and then sterilized; the second, crab meat which has been prepared, processed, and packed in a plant under permit of a Federal or state inspection service approved by New York City's Department of Health.

Regardless of whether a plant may pass inspection, the Health Department of New York City is empowered to exclude any packer from shipping crab meat to that city if the meat is suspected of containing bacteria in excess of the following standards:

More than 100 hemolytic (Staphylococcus aureus) per gram of meat, or

More than 100 coliform organisms per gram of meat, or

More than 1,000 enterococcus organisms per gram of meat, or

More than 100,000 colonies (groups of bacteria) per gram in the total plate count.

In order to reach a full understanding of these standards it is necessary to know what the terms mean. A gram is a unit of weight; there are approximately 454 grams in a pound or about 28 grams in an ounce. When the numbers of bacteria are reported in terms of numbers of organisms per gram, that number represents $\frac{1}{454}$ of the theoretical total number of organisms in the pound of meat.

Enterococcus is a group of bacteria. Like E. coli it indicates human or animal contamination when present in food. Enterococci bacteria are easily recognized, and their presence is more reliable as indicators of animal pollution since they are not as abundant as E. coli.

Hemolytic Staphylococcus aureus is another kind of bacteria. These bacteria are known as pathogens or disease producers. They secrete a poisonous material which produces an acute stomach and intestinal inflamation. This poisonous substance is not destroyed by heat, and pasteurization at temperatures less than 170° F. probably have no effect on it.

Staphylococcus aureus is found on the skin and mucous membranes of the animal and human body, especially of the nose and mouth, where they often occur in large numbers under normal conditions. It is also the cause of boils, carbuncles, and internal abscesses in man and of mastitis in cows. Hence crab meat can become infected with this organism if handled by careless persons.

The total bacteria plate count merely expresses the total number of organisms in a one-gram sample, without attempting to distinguish one type of bacteria from another.

This type of examination indicates the general sanitary conditions under which the meat was packed.

As a result of the efforts of the Federal Government, the City of New York, and the health departments of the states concerned, the industry has become conscious of quality. One of the most direct methods of contamination of crab meat is from the hands of the pickers or other crab-plant employees. If the hands of the pickers are kept constantly clean this major source of contamination will be removed. Cleanliness in this respect does not mean the mere washing of the hands, it means that the hands and fingernails must be scrupulously clean at all times.

Contamination also occurs if flies, rodents, or roaches come into contact with the crab meat or with utensils used in the processing of the meat. Since these pests frequent the sources of contamination, they must be kept under control if clean crab meat is to be produced.

The above does not attempt to give details on complete sanitation control in a crab plant, but merely to emphasize basic rules of cleanliness that are apt to be forgotten in a daily routine. The dealer must realize that the problem of running a sanitary plant is his responsibility and that it is not a part-time, but rather a full-time job, and will require his complete attention.

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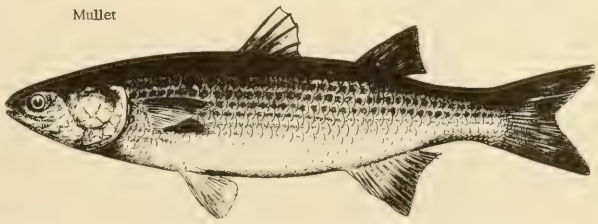
FISHERIES RESEARCH, JULY-DECEMBER 1954: Marketing (Mainly Mullet): A survey of the existing literature of the problems of marketing of fresh fishery products of Florida origin was made in the third quarter of 1954 by the University of Miami Marine Laboratory. To obtain first-hand information as to what the present problems are, two extensive field trips were made, one along each coastline of Florida. Fifty-three of the larger wholesale dealers were interviewed and some of the larger retail dealers and fishermen were queried. Information was obtained about the status of each fisherman as to production, the problems he faced, the supply and demand, of the desirability of his produce to the public, price fluctuations and their causes, quality of production, and methods of handling. Opinions were asked as to what each fisherman thought were the determining factors in upsetting the fresh-fish market and suggestions were recorded as to what could be done, in the opinion of the fisherman, about improving the situation and rehabilitating the fresh-fish market. Particular references were made to mullet but information on other food fishes was recorded.


Mullet

Opinions on the establishment of processing plants in Florida to compete with northern fishery products which have apparently pushed Florida fish off the market were gathered from all of the major dealers with special reference given to the geographic, financial, and economic problems involved in such a proposal. Frozen fillets, canned and smoked fish, and fish sticks were discussed as a new market for fresh fish, and dealers were asked if they would be able to financially support the undertaking of a processing plant, sell to a processing plant, or would show no interest in a processing plant.

With a basic general knowledge of the marketing and production problems confronting the Florida fresh-fish industry, the next step was to get actual statistics on the past and present fluctuations in the market for fresh fish. Particular reference is being paid to mullet due to its preponderance in the Florida catch. Inasmuch

as 90 percent of the mullet produced in Florida is sold out of the state, the problem will be to find out where these are sold, how many, and how this distribution has fluctuated in space and time. Attitudes of wholesale buyers to mullet will be obtained, and chief competitors of mullet will be studied.

Research is being undertaken to compile a list of alternate names for mullet in view of the unpleasant connotations of this fish on local markets. These names will be reviewed and an alternate name will be submitted to the U. S. Food and Drug Administration for use as a substitute name to acquire northern markets and regain many lost southern markets.

The preliminary phases of the marketing study were completed in the final quarter of 1954. These included a canvas of the wholesale fish dealers of the state to obtain their opinions concerning the feasibility of increased production of processed fish in Florida, methods of improving quality, the price structure, improved production methods, and publicity methods. The valuable information thus gained is being organized and reduced to usable form.

The other major field activity in this investigation during the October-December 1954 period was a trip to the major markets for Florida fish, chiefly mullet, outside the state. The investigator interviewed 31 wholesale and distributing dealers in Georgia, Tennessee, North Carolina, and South Carolina. It was found that the largest market for Florida mullet appears to be in Georgia, particularly in south Georgia. Most of the mullet is bought in Florida but some comes from Alabama. During certain seasons the Carolinas produce smaller fish but despite their size they appear to compete successfully with Florida mullet because of their frequently better quality.

This southeastern region seems to be definitely a fresh-fish consuming area, and attempts to introduce a market for processed mullet might be unsuccessful. The per-capita consumption appears to be quite high. The market for processed fish seems to increase toward the periphery of this region, such as Chattanooga, Tenn.; and Charleston, S. C. Perhaps canned mullet could be successfully introduced into these areas. Frozen round mullet, while acceptable, is considerably less desirable to these areas and is bought only when fresh mullet are unobtainable during the closed season. One of the biggest promoters of fresh mullet is the roe obtained during the fall of the year. Many people buy the mullet for the roe alone.

Preliminary observations seem to indicate that the market for mullet has fallen off only at the outer fringe of the southeastern area. However, this area is being rapidly invaded by less expensive, and sometimes fresher, northern fish such as fresh and frozen scup or porgy (Stenotomus), croaker, and whiting. These species appear to offer serious competition, mainly on the basis of the low price (one-half to one-third the cost of mullet). Since this area can be considered rather typical of the lower-income bracket, a low-price fish in fairly fresh condition seems to be the biggest seller in this region. These fish may in time push the sales area of mullet further south so that the market may dwindle further.

Frozen fish, either domestic or foreign, does not appear to offer any considerable competition with fresh fish from Florida. Many of the chain stores are freezing mullet in the round and wrapping them in cellophane. These are somewhat preferred to frozen fish sticks and fillets such as ocean perch, whiting, and haddock.

The over-all picture seems to be that the southeastern area is very satisfied with the taste and quality of mullet, but that this region, at present the market for about 90 percent of Florida mullet, may futher dwindle due to lower-price fresh fish from New York and Virginia. Due to an extremely bad crop year, the economic situation is poor and people are interested in low-priced products. The low cost of meat and poultry at certain seasons has resulted in a loss of a market for a considerable

amount of fresh fish from all areas. Even if it is possible to produce mullet at a lower cost, it does not appear that it will result in any considerable regaining of these lost markets. While people will of course like a low-priced fish, these areas appear satisfied with the price in accordance with the quality and the extra roe.

A shipment of mullet was sent to a smoker in Baltimore to determine the reaction of markets in this area to smoked mullet. If results are favorable, further shipments to this and other areas will be made to attempt to create new markets for the Florida production of mullet and other species.

A new canned fish product, canned Florida mullet, has been developed by the Food Technology Department of the University of Miami. Canned mullet has a good texture and a pleasant flavor, very similar to canned salmon. The product was first prepared as a student laboratory exercise, but it has undergone four years of storage tests, and further research on methods of commercial production and handling are under way. By providing a low-priced product, canned Florida mullet may be a means of increasing the utilization of this fish.

Shrimp Explorations: In June 1954 the Diesel Engine Sales Company of St. Augustine loaned the new trawler Goodwill to the Tampa Shrimp Producer's Association for exploratory shrimp fishing. At the request of the Association a scientist from the University of Miami Marine Laboratory accompanied the vessel on several cruises to assist in the planning of the operation and to make observations. These trips extended over about $2\frac{1}{2}$ months.

The first cruises were in the area between Tampa and Cape San Blas and Tampa and Anclote Light. Thirty-five drags were made with try nets, in water 10 to 60 fathoms deep. No commercial concentrations of shrimp were found and the bottom was made hazardous for trawling by the presence of sponge and coral.

At 29°05' N. latitude and 85°25' W. longitude an interesting discovery was made of a scallop bed about 6 miles long. The scallops caught were of commercial variety., $1\frac{3}{4}$-3 inches long. The bed is large enough to be of commercial importance.

In early July a small bed of shrimp was found off Tarpon Springs (at 28°07' N., 83°10' W.). The catch rate was 275 pounds of heads-on shrimp per hour with a 375-mesh flat trawl. Seventeen boxes were caught in two nights of fishing.

Tests were made with the "Shrimplupe," an electronic detection device. It was useful in locating obstructions but it could not be said to have detected shrimp.

In August 1954 the Goodwill operated between Tampa and the Middle Ground area. No large concentrations of shrimp were found. The few shrimp caught were large in size, 10-20 count per pound (heads on).

Fourth quarter 1954 exploratory shrimp fishing was done in the Gulf of Guacanaybo on the south coast of Cuba. Results were not encouraging. Shrimp caught (Penaeus schmitti, a white shrimp, and P. duorarum, the pink-grooved shrimp) were small and catches were poor. Indications were that only about one box (100 pounds) of headless 30-count shrimp could be caught per night in this area.

Blue Crabs: Encouraging progress in the blue-crab investigations was reported by the University of Miami Marine Laboratory. In August 1954 the operation of the Chesapeake Bay crab scrape at Punta Gorda was not successful, due perhaps to the high water temperatures prevailing. In September, however, the scrape caught considerable quantities of "prepeelers." These were put in floats built for the purpose, and a small but steady production of soft-shell crabs has resulted. A profit is being shown by the operator engaging in this experimental project. Expansion is

planned, and other areas will now be tested to study the feasibility of establishing soft-shell crab operations in other parts of Florida. Markets have already been established for the product.

Advice and encouragement has also been given to crab dealers who wish to attempt canned "pasteurized" crab meat. This product is not fully sterilized and is not comparable to a fully heat-processed canned product, but will keep longer than the meat marketed fresh. Several dealers are trying this method with apparent success.

Trials were initiated with a fyke net to determine whether crabs could be caught in this gear. Results were expected in January 1955.

Considerable work was done to discover if the method of processing crab meat by pasteurization could be adopted to the Florida industry. This method was developed by a Maryland crab producer in conjunction with the U. S. Fish and Wildlife Service. Taste panel tests showed that properly pasteurized crab meat compares favorably with the fresh product and some companies are in production while others are showing interest in the method.

Advice and assistance was given to established and new crab processors in the problems of sanitation and quality control. This problem has been made particularly serious by much stricter quality rules set up by some important northern markets. Most Florida plants are now meeting the new requirements or are making the necessary changes to meet them in the near future.

Scallops: No commercial scallop fishery operated in the summer of 1954 in Lee County, Florida. The scallops were presumably killed by a "red tide" outbreak. Investigations of the grounds showed that one to three bushels of scallops could be caught per day in either of two small areas, but no other area of the Sound yielded any catch. Small samples were available for study.

The Lee County scallop fishery research was completed in the final quarter of 1954 and a final report was in preparation. No attempt is made here to summarize the whole report, but one interesting aspect of local scallop life history concerning spawning and growth is presented in brief.

It has been found that spawning occurs during all four seasons of the year; however, for any one group of scallops the time of spawning appears to be of shorter duration. As a result, scallops of various sizes may be found on the grounds throughout the year. The proportion of each size group changes throughout the year due to the varying spawning times, and differential growth and mortality rates.

The biggest group may come from a late spring and early summer spawning. This group attains a size of approximately $1\frac{1}{5}$ inches by the winter when growth is slower, and then grows rapidly in size until the following winter. Mortalities remove most of this group before their second summer.

A minor group may appear during the late summer, fall, and winter and grow to a size of less than one inch prior to the early spring season when growth becomes rapid. This group survives the next winter at a size larger than two inches. These may remain in the fishery until they are about two years of age when most or all disappear.

The largest scallops found in this area had a shell length measurement of slightly over 3 inches; however, this size is rarely attained.

From 1950 to 1953 over 70 percent of the Florida scallop landings have come during June, July, and August. There was essentially no production in this area

during 1954 due to the heavy mortalities suffered that year. The situation will be watched carefully to see if the fishery is able to re-establish itself during the next few years.

Electrical Fishing: The analysis of the results of the shrimp electrical experiment was completed. In the course of this investigation, it was shown that pulsed direct current could be successfully used to cause pink-grooved shrimp, Penaeus duorarum, to swim tail first to the positive pole. The optimum electrical conditions that caused this forced movement were determined.

Using this basic information, calculations were made of the power requirements necessary to electrify a conventional shrimp trawl. These calculations show that the use of electrical current as a commercial fishing aid is impractical at this time. Both the cost and size of the electrical generator would prevent its use.

There are further indications from the data of this experiment that electrical fishing might be possible if suitable electronic equipment could be developed which would employ electrical impulses of high intensity and short impulse duration. Condenser and battery discharge are systems which lend themselves to this application with resultant lowering of power requirements.

Gulf Exploratory Fishery Program

GOOD LONG-LINE TUNA FISHING FOUND IN CARIBBEAN BY "OREGON" (Cruise 30): Good long-line tuna fishing was found east of Jamaica and in the Windward Passage area by the Service's exploratory fishing vessel Oregon. During the four-week cruise (April 6-May 2) eleven 42-basket long-line sets were made in the northwestern Caribbean and three sets were made in the central Gulf of Mexico. Yellowfin tuna were caught at 6 of the 7 stations east and north of Jamaica and in the Windward Passage at rates of 1 to 2.6 yellowfin per 100 hooks. At each of these 6 stations from one to six 50- to 60- pound albacore tuna (Thunnus alalunga) were also caught. Considerable difficulty was encountered during two sets at the head of the Windward Passage due to large numbers of giant bluefin tuna in that area. At each of these stations 8 bluefin tuna were landed weighing from 400-600 pounds each. Judging by broken gear, at least that many more were caught and lost.

Location of long-line sets (x) during Oregon's Cruise 30, 4/6-5/2/55.

The four sets made between the Yucatan Channel and the western tip of Jamaica caught no yellowfin or albacore tuna. One large bluefin was caught north of Grand Cayman and another was caught on a set east of Cozumel Island.

Three sets were made in the Gulf of Mexico. A single yellowfin was caught on the last set of the trip (May 1) 180 miles south of Mobile. This fish weighed 190 pounds and is the largest yellowfin that has been caught in the Gulf to date. At the

same station a 14-foot false killer whale became entangled in the long-line gear and was landed.

In cooperation with a staff member of the Woods Hole Oceanographic Institution, 18 of the marlin taken on the long lines were tagged and released. Two big-eyed tunas weighing 175 pounds each were taken on a set made near the southwest tip of Hispaniola. Plankton collections and night-light collections were made by the Fishery Biologist assigned to the cruise from the Service's station at Galveston.

To further explore potential red shrimp beds with commercial-scale trawls, the Oregon was scheduled to leave Pascagoula on May 17 (Cruise 31). Additional trawling exploration was to be carried out on extensive areas of apparently good trawling bottom in the red-shrimp depth ranges in the Florida Straits area and southeast of Cay Sal Bank. In April 1954 a series of shrimp-trawl drags south of Dry Tortugas in depths of 170-250 fathoms yielded promising catches of deep-water red shrimp (Hymenapenaeus robustus). Due to damage sustained when a trawling obstacle was encountered, drags with larger commercial-type trawls were not made at that time.

Tuna long-line sets were to be made between Cuba and the Bahama Bank as a further check on the seasonal range of commercially-valuable tunas in the Gulf and Caribbean area. The Oregon was scheduled to return to Pascagoula on June 14.

Long Island Sound Oyster Investigations

OYSTER SPAWNING AND SETTING FORMULAE: About 25 years ago knowledge of the reproduction of oysters in Long Island Sound was rather limited and many of its aspects were covered by a veil of mystery. We do not know all the answers now, but we have learned so much since that time that it is amusing to recall certain ideas expressed by some of the old-timers.

The industry has always been interested in the time when the oysters begin to spawn and the time when "setting" occurs. The oysters "set" when the larvae descend to the bottom and become small oysters. This change, or metamorphosis, from the swimming to the sedentary stage is known as setting.

Each of the old-timers had his own unshakable opinion about the behavior of oysters, and it was unusual if two oystermen agreed on any subject. For example, some insisted that setting occurred only in August, others thought that it took place only during the third week of September, and still others--and this is a fact--maintained that some oysters spawn and set even in winter. Further, some oystermen said that all oysters of a new generation set on the same day all over the Sound, while other oystermen believed that there were 2 or 3 distinct sets--perhaps 6 weeks apart. Many other opinions were also supported vigorously.

To sum up, nobody knew much about the subject. Yet, the dates of the beginning of spawning and especially of setting were--and still are--of great practical importance to the industry, for by the latter date the oystermen should have the grounds fully prepared to receive the new generation of oysters. This preparation consists of cleaning the oyster beds and planting clean oyster shells (the cultch) to provide attachment for the descending oyster larvae. Some of the largest oyster companies of Long Island Sound plant as many as a million bushels of shells every year, and that quantity indicates that the planting is a rather extensive and expensive undertaking. Obviously, planting shells at the proper time is essential. If they are planted too late, they will miss the set. If they are planted too early, they may become fouled and become unsuitable for attachment of the larvae.

Systematic and persistent research of biologists eventually helped to clear up many mysteries. Several years ago the U. S. Fish and Wildlife Service was able to offer the industry the following formulae:

> In Long Island Sound the beginning of spawning should be expected on June 30 $\pm$ 4 days, and the beginning of setting should be expected on July 19 $\pm$ 4 days.

These formulae have held up rather well thus far, and now the industry fully depends on them.

Many other data, such as the extent of the setting period, intensity of setting in relation to time and depth, and growth and survival of young oysters under different conditions, have given the oystermen much needed practical information since the Service's studies began.

--Victor J. Loosanoff, Research Biologist,
Long Island Sound Oyster Investigation,
U. S. Fish and Wildlife Service,
Branch of Fishery Biology,
Milford, Conn.

Maine Herring Exploration and Gear Research

"THEODORE N. GILL" SAILS ON INITIAL CRUISE (Cruise 1): The first of a series of exploratory herring fishing cruises in the Gulf of Maine and adjacent waters was commenced on April 19 when the Service's research vessel Theodore N. Gill departed Boothbay Harbor, Me. These explorations will be made in an attempt to locate herring schools and to follow them on their migrations inshore as the season progresses.

On this cruise it is planned to cover the entire Gulf from Cape Cod to Cape Sable in two weeks by running parallel transects at 10-mile intervals from the coast line to 170 miles offshore. These courses will be run while sounding for herring with a vertical echo sounder, and a "Sea Scanar" which sounds to the sides and a-

Service's research vessel Theodore N. Gill.

head of the vessel as well as below it. Lift nets will be operated to sample the schools encountered. Plankton tows will be made and continuous water-temperature records kept during the cruise.

The northeastern part of the Gulf east of 67°30' W. longitude will be covered by the Canadian research vessel Harengus, sounding with the same type of gear during the same period of time. Results of the two cruises will be integrated to give an indication of distribution of herring schools and the size of the fish that comprise them. Any schools located will be followed during successive cruises to be made by the two vessels as the season progresses.

Michigan

GREAT LAKES COMMERCIAL FISHERIES PRODUCTION, 1954: Commercial fishermen took 27 million pounds of fish from Michigan's Great Lakes waters during 1954, one million pounds above the average annual catch, a recent bulletin from the Michigan Department of Conservation reports.

Herring provided 8.5 million pounds and smelt ran second with an all-time record of 4.9 million pounds. Chubs, carp, lake trout, and yellow perch combined made up another 9 million pounds, and 16 other types of fish comprised the remainder.

Only 85 pounds of lake trout were taken in Lake Michigan and none was caught in either Lake Huron or Lake Erie during the year. Until the sea lamprey depredations of recent years, lake trout from these lakes provided the bulk of a $2 million industry. Now, lake trout come mostly from Lake Superior where the sea lamprey is still found only in small numbers. In 1954, 1.6 million pounds were produced from Superior.

Lake Michigan produced 14.2 million pounds of the total catch, Lake Superior 5.8 million pounds, Lake Huron 5.4 million pounds, and Lake Erie about 1.8 million pounds.

Montana

DIRECT-CURRENT FISH-SHOCKING TECHNIQUE DEVELOPED: The development of a direct-current fish-shocking technique using two negative electrodes and one floating positive electrode was reported by fishery biologists assigned to a "test stream" study conducted in Flint Creek near Philipsburg, Mont., by the Montana Fish and Game Department.

The technique is described as follows:

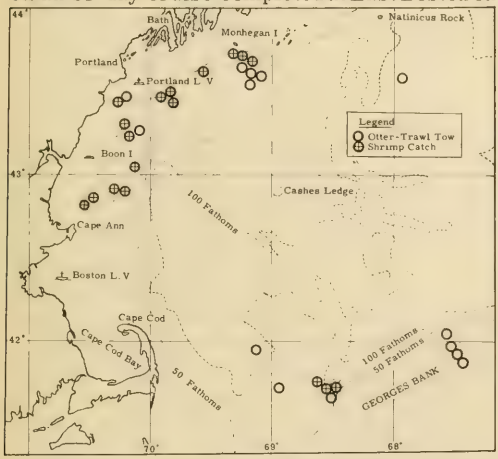
"Fish are 'repelled' from the two negative electrodes near the stream banks and 'attracted' to the floating positive electrode near the center of the stream channel. This system is particularly advantageous in Flint Creek where dense willows along the banks would make netting of shocked fish extremely difficult if it were not possible to 'attract' the fish into the open channel. Fish attracted to the positive electrode in water ranging from 1.4 to 3.5 feet per second line up at the surface of the water along the downstream edge of the triangular wooden electrode frame and are easily captured in a dip net. In water of lower velocities, it is necessary to move the positive electrode in such a way that 'attracted' fish will swim along at the trail-

ing edge until netted. In water of higher velocity than 3.5 feet per second, the shocked fish are simply swept downstream by the water current and are captured later in a more favorable spot.

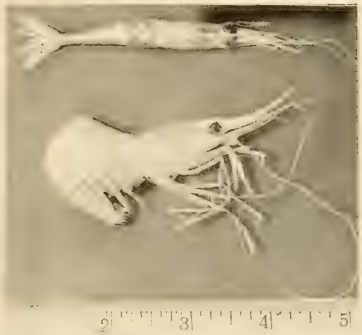
"The floating wooden triangle of the positive electrode is attached to its handle by a strap hinge which gives the desired flexibility as well as sufficient control over movement in the horizontal direction. Thin-wall conduit (either $\frac{3}{4}$ inch or 1 inch in size) provides light yet sturdy handles and frames for dip nets and electrodes. Common copper screen (16 mesh per inch) is used for the electrode surface of the positive electrode, and copper tubing ($\frac{1}{8}$ inch) is used for the grids on the negative electrodes."

New England Exploratory Fishery Program

"DELAWARE" FINDS SHRIMP IN GULF OF MAINE (Cruise 4): Northern shrimp (Pandalus borealis) were not taken in commercial quantities in any of the tows made by the Service's exploratory fishing vessel Delaware in the Gulf of Maine on an 11-day cruise completed at East Boston on April 28. As was the case in Cruise



M/V Delaware--Exploratory Fishing Trip No. 4--April 18-21, 1955



Two specimens of Atlantic Coast northern shrimp (Pandalus borealis). Characteristics of this species are: (1) a tubercle or small spine on the dorsal surface of the rear half of the third abdominal segment; (2) a bifid rostrum, with the lower tip projecting beyond the upper tip. Note the eggs on the larger specimen. (Large specimen does not have legs in normal position.)

3, the greatest catches of shrimp were made in the vicinity of Wood Island, Me.; an area that produced shrimp in commercial quantities in the late 1940's.

This was the fourth cruise of a series to determine the present abundance of northern shrimp in waters which formerly supported a commercial fishery in the winter months.

A total of 32 tows was made (see chart), most of them with a small-meshed No. 36 net.

The female northern shrimp, virtually all of which were egg-bearing in February, had mostly shed their eggs by the time of this cruise.

Nets were torn on several of the tows along the Maine Coast, and two fishing days were lost due to stormy weather.

The Delaware was scheduled to depart May 9 on Cruise 5. This 12-day cruise will be the third of a series to explore the commercial potential of groundfish on the edge of the continental shelf, in water deeper than is ordinarily fished commercially.

Ohio

Ohio's Lake Erie Commercial Fisheries Production, 1954 with Comparisons

Species	1954	1953	1952	1951
	(1,000 Lbs.)			
Blue pike	4,576	6,853	5,531	1,867
Bullheads	94	52	58	44
Burbot	91	148	230	178
Carp	2,618	1,792	2,108	1,559
Catfish	1,844	1,330	1,492	1,258
Cisco	48	26	21	92
Goldfish	82	98	100	126
Mooneye	6	12	14	21
Sauger	76	189	203	388
Sheepshead	1,691	1,896	3,513	3,503
Sturgeon	2	1	6	10
Suckers	333	319	587	517
White bass	2,820	1,102	765	944
Whitefish	145	136	213	375
Yellow perch	3,991	3,208	1,556	2,397
Yellow pickerel	4,971	5,752	4,840	5,418
Buffalofish	41	35	8	2
Miscellaneous	6	2	2	1
Total	23,435	22,951	21,247	18,700

LAKE ERIE COMMERCIAL FISHERIES, 1954: The total catch of freshwater fish by Ohio's commercial fisheries of Lake Erie amounted to 23.4 million pounds in 1954, a 2-percent increase over the 23.0 million pounds landed in 1953, reports a recent bulletin from the Ohio Department of Natural Resources (see table). The increase was due to larger catches of carp, catfish, white bass, and yellow perch. Landings of blue pike and yellow pickerel were lighter in 1954.

The leading species on the basis of quantity landed by Ohio's Lake Erie commercial fishermen was yellow pickerel, which comprised 21 percent of the total; followed by blue pike, 20 percent; yellow perch, 17 percent; white bass, 12 percent; and carp, 11 percent. In 1953 blue pike accounted for 30 percent of the total catch; followed by yellow pickerel, 25 percent; and yellow perch, 14 percent.

North Atlantic Fisheries Investigations

VARIOUS MESH-SIZE COD ENDS TESTED IN HADDOCK FISHING BY "ALBATROSS III" (Cruise 59): A six-day fishing cruise to determine the selectivity of sizes of haddock caught with cod ends of 7-, 7½-, and 8-inch meshes (between centers) was completed at Woods Hole, Mass., on April 12 by the Service's research vessel Albatross III.

Mesh Sizes When New1/	Mesh Size When Used and Wet1/	50-Percent Point
Inches	Inches	cm.
8	6	54
7½	6	52
7	5½	48

1/Inside measurements.

Favorable quantities of fish were found south of La Have Bank when 34 tows were made. Up to 4,000 pounds were taken. Selection curves for the three cod ends were established (see table).

Four sets were made SE. of "The Leg" on Georges Bank. Good quantities of scrod haddock were obtained and 125 live haddock were returned to the Woods Hole laboratory for tagging and growth studies.

Otoliths, cleithra, scales, length, and maturity information were collected from haddock caught on La Have and Georges banks.

Pacific Oceanic Fisheries Investigations

STEEL TUNA LONG LINES SUCCESSFULLY TESTED IN LINE ISLANDS WATERS BY "JOHN R. MANNING" (Cruise 24): The new steel "D" ring long-line tuna gear was found easier to handle than the standard cotton line on a three-week tuna-fishing cruise by the Service's research vessel John R. Manning in the rich yellowfin tuna grounds near the equator south of Hawaii. The cruise was completed at Honolulu on April 15. The steel gear developed only few bad tangles even with the abundance of sharks in the area and the frequent catch of large marlin. Thirty baskets of steel long-line gear were fished together each day. The addition of swiveling "D" rings to the steel gear and the use of nylon droppers reduced considerably the loss of fish and dropper lines previously experienced with the steel gear. In setting the steel gear a new device was used for automatically attaching the dropper lines.

The underlying purpose of these attempts to mechanize the long-line method of fishing for tuna, heretofore used on a large scale only by the Japanese, is to cut down the amount of manpower required and thus make it economically feasible for American fishermen to exploit the resources of deep-swimming tuna that only the long line can reach. The newly-developed fishing gear features a steel main line which is set and hauled with reels powered by a small winch. At appropriate intervals along this cable D-shaped rings are fitted for the attachment of the branch lines, which bear the hooks. A device has been developed to snap the branch lines on these rings automatically as the gear is payed out, a task which must be done by hand on the traditional type of long line.

Ten days fishing with 60 baskets of gear set each day produced a total of 128 yellowfin tuna, 4 big-eyed tuna, 2 skipjack tuna, 9 marlin, and 133 sharks. The yellowfin catch totaled about 6 tons. The best day's catch (42 yellowfin) was made off Christmas Island; the second best catch (21 yellowfin) was made at Washington Island. The open ocean catches were generally poor.

An interesting incident of the cruise was the landing of a huge white marlin, estimated to have weighed around 1,500 pounds, which had in its stomach a freshly killed yellowfin tuna 5 feet in length and weighing 157 pounds. Some light was thrown on the question, often debated by fishermen, of the use that marlin make of their bills in capturing their prey--the tuna had been speared clean through its body twice before being swallowed.

On 6 fishing days on which the John R. Manning and the Charles H. Gilbert set long-lines in close proximity, the daily catches of the 2 vessels were almost identical.

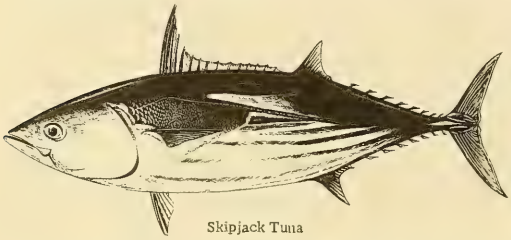
Quantitative pelagic trawl collections were obtained at 13 stations and will provide material for examining variations in abundance of forage organisms in the open ocean and along the Line Island chain.

Eleven yellowfin and 3 big-eyed tuna, all over 150 pounds in weight, were butchered into loins and labeled, wrapped, and dry frozen for subsequent experiments in canning by the Pauley Process.

During the long-line fishing, 47 yellowfin tuna were brought aboard alive, tagged, and released. A record was kept of tuna schools, bird flocks, and aquatic mammals sighted. Surface trolling was conducted during daylight hours on the runs to and from the fishing grounds.

* * * * *

SKIPJACK TUNA TAGGED BY "HUGH M. SMITH" (Cruise 28): A total of 107 skipjack tuna were tagged by the Service's research vessel Hugh M. Smith on a one-month cruise in the area around the Hawaiian Islands, completed at Honolulu on April 8. The California-type plastic tube tag was used and the fish were released in apparently viable condition. The fish were all small (3- to 7-pound size) and caused no difficulty in tagging. One slow biting school was fished and tagged with considerable ease and effectiveness as 62 of the 70 skipjack caught were marked and released. These fish were tagged in 17 days of scouting and fishing prior to the onset of the summer fishing season with hopes of obtaining some recoveries during the season to check for injuries and survival caused by tagging.



Skipjack Tuna

This makes a total of 285 fish marked since the tagging work was initiated last summer. The recapture of any of these tagged tuna would give invaluable information, not only about their migratory movements, but also about their age and rate of growth, matters which otherwise can only be deduced by indirect methods. All commercial and sport fishermen are therefore urged to report without fail the recapture of any tagged skipjack with the fullest possible information on the time and place of capture.

This cruise was the latest in a continuing series planned to survey the seasonal changes in the abundance of this small striped tuna species, which in the summer is the basis of the largest fishery and the only fish-canning industry in the Hawaiian Islands, but which becomes very scarce in local waters in the winter. By scouting for skipjack schools at all seasons of the year, and by tagging and releasing captured fish, the Service hopes to obtain information on the movements of the fish that may enable fishermen to enlarge their fishing grounds over greater areas and to extend their season of highly productive fishing over a greater part of the year.

A total of 35 bird-flock-attended schools were sighted--6 were identified as skipjack; 1 a mixed school of skipjack, yellowfin, and mahimahi (dolphin); and 28 unidentified. Most of the promising fish schools were seen beyond 35 miles from land especially in areas south of Oahu, Molokai, and Lanai, while in the vicinity of Kauai they were sighted within 20 miles of land. Schools encountered at this time, however, were generally fast or erratic in their movements and proved troublesome in fishing. Live-bait fishing was attempted on 15 schools but fish were caught from only 3 of these schools.

Other work carried out on the cruise included: (1) recording thermograph was operated continuously out at sea; (2) whenever possible, BT observations were made at three-hour intervals on all scouting runs and also immediately after fishing; (3) some good traces of skipjack schools were obtained on the Bendix.

* * * * *

PROPOSED PROGRAM FOR 1955: At a meeting between Service representatives and the POFI Tuna Industry Advisory Committee on April 4-5 at Terminal Island, Calif.; the following program was proposed for the Service's 1955 Pacific Oceanic Fishery Investigations:

Equatorial Tuna: (1) Help insure successful commercial fishing of yellowfin tuna in equatorial waters by ascertaining the effect of changes in weather and currents of the quantities and sizes of yellowfin.

(2) Continue improving the steel and fiber gear used in the long-line method of fishing.

(3) Estimate the contribution of the countercurrent and upwelling in the eastern Pacific to tuna production in the central equatorial Pacific by joint operations with West Coast agencies.

(4) If it is found within the legal responsibility of POFI, develop a program of investigation of the tuna stocks in Southeast Polynesia.

Hawaiian Skipjack Tuna: (1) Learn more of the off-season distribution of skipjack tuna by sight scouting and echo ranging.

(2) Use new electronic scanning device to study the behavior and movement of skipjack schools; and experiment with tagging as a means of learning skipjack migrations in the vicinity of the Hawaiian Islands.

(3) Complete the analysis of conventional oceanographic surveys of the waters surrounding the Hawaiian Islands and continue specialized observations on the eddy system in conjunction with (1) and (2).

Tuna Bait Studies: (1) Continue developing, with sea tests, motile lures which combine movement with appearance, taste, and smell this to be augmented with studies of the structure and use of the tuna eye to learn more about the ways in which tunas can be attracted to catching devices.

(2) Continue studies of electro-fishing on tuna in ponds in order to design an electrical unit for sea tests.

(3) Continue observations of occurrence of live bait as opportunity affords in (a) Leeward Islands; (b) Around equatorial islands; and (c) Investigate open-ocean saury baiting in northern waters.

Albacore Tuna: (1) Continue studies of the winter distribution of albacore tuna and the related oceanographic conditions in the North Pacific.

(2) Cooperate with West Coast agencies in locating small albacore in advance of the Pacific Coast season and in investigating the causes of shifts in time of appearance of albacore, as well as the marked change in amount taken by the Pacific Coast fishery from year to year.

(3) Study the summer vertical and horizontal distribution of egg, larvae, and adult albacore north of Hawaii. Cooperate with oceanographic groups in the United States, Canada, and Japan in a comprehensive North Pacific oceanographic and plankton survey.

(4) Try to catch albacore on the high seas by live bait, deep and surface trolling, and long lines.

(5) Develop a Pacific-wide albacore core tagging program.

Saltonstall-Kennedy Act Fisheries Projects

FISHERY STATISTICAL OFFICE OPENED IN LA CROSSE, WIS.: A statistical office for the collection of fishery data was opened recently at La Crosse, Wis., by the U. S. Fish and Wildlife Service's Branch of Commercial Fisheries. Activities of the La Crosse office will include obtaining detailed data on employment in the fisheries, the number of craft and quantity of gear operated, and the catch of fishery products in the upper Mississippi River area. The office is located in the Service's Fish-Cultural Station at La Crosse. The address is Post Office Box 862. Kevin J. Allen, who was formerly engaged in the seafood business in the New Bedford, Mass., area is in charge of the office.

This project is being financed by funds provided by the Saltonstall-Kennedy Act (68 Stat. 376).

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SERVICE OPENS FISHERY STATISTICAL OFFICE IN BILOXI, MISS.: A statistical office for the collection of fishery data was opened recently at Biloxi, Miss., by the Service's Branch of Commercial Fisheries. Activities of the Biloxi office will include obtaining detailed data on employment in the fisheries, number of craft and quantity of gear operated, the catch of fishery products, and related activities in Mississippi; as well as the collection of certain data on the fisheries of Alabama. Detailed statistics on the shrimp fishery will be obtained for Biloxi and nearby ports in connection with the Service's expanded program for the collection of shrimp statistics.

Hermes G. Hague, who has engaged in fishing operations in the Gulf and who was, for a time, employed by the Service in its exploratory fishing program in the Gulf, will be in charge of the office.

This project is being financed by funds provided by the Saltonstall-Kennedy Act (68 Stat. 376).

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PROGRESS ON BRANCH OF COMMERCIAL FISHERIES PROJECTS (MAY 1955): This is a report of the status as of mid-May 1955 of the various Saltonstall-Kennedy Act projects under way in the U. S. Fish and Wildlife Service's Branch of Commercial Fisheries and financed by funds provided by P. L. 466 (83rd Congress).

1. North Atlantic Fisheries Exploration and Gear Research: A program to explore the fishery resources of the North Atlantic area and to develop more effective fishing gear for use in that area. The program is based at East Boston, Mass.; and is in full operation using the Service's exploratory fishing trawler Delaware.

The Delaware was outfitted with new electronic fish finder and additional trawling cable, which will allow fishing to depths of 400 fathoms.

Seven cruises were completed to explore deep-water grounds on the edge of Georges Bank and to explore potential shrimpareas in the Gulf of Maine--1,000 pounds of 10-pound lobsters were caught in a single drag; shrimp appear to have moved from grounds fished some years ago; and catches of other fish have not been large.

Cost of project: $160,000 a year.

2. Maine Herring Exploration and Gear Research: A project to determine more fully the availability of herring in New England waters in order to smooth out the fluctuations in supply that have been plaguing the Maine sardine industry.

The Service research vessel T. N. Gill was transferred to Boothbay Harbor, Me.; and outfitted with a "Sea Scanar" and experimental gear for sampling surface and subsurface herring schools.

The first exploratory cruise in the Gulf of Maine began on April 19. The research program was laid out in cooperation with the Branch of Fishery Biology and the Canadian Department of Fisheries, and with the advice of the Maine Sardine Industry.

Cost of project: $76,000 a year.

3. Research on Methods of Handling, Freezing, and Packaging Southern Oysters: A project to study improvements in the methods of handling, freezing, and marketing Southern oysters.

The College Park, Md., laboratory completed analyses on representative samples of oysters collected to measure seasonal variability in composition. These data will provide background information for research contractors at a later date. Contracts for research were let with these Gulf area universities: Louisiana State University, Tulane University, and Florida State University.

The first group discussion of research under way at each of these universities was held in New Orleans on April 24.

Cost of project: $40,000 a year.

4. Development of Voluntary Standards of Grade and Condition for Fishery Products: A program to develop voluntary grades and standards for various fishery products.

(a) A contract was awarded the National Fisheries Institute for industry liaison assistance in the development of grades and standards. The contractor has now completed a survey of producers, packers, and distributors in the principal production and marketing areas throughout the United States. A complete report of this survey was being prepared. Preliminary information indicates that cooked fish sticks will have the highest priority for development of grade standards. Second priority probably will be assigned to breaded shrimp, and third to ocean perch frozen fillets.

(b) Personnel have been recruited for the Service research phases of standards development and are now engaged in research. Two other contracts for research on the standards project were awarded. The University of Washington is evaluating the principal chemical methods for the measurement of freshness of fishery products on a one-year contract. Massachusetts Institute of Technology is developing new objective tests for freshness of fish and fishery products under a one year contract.

(c) At the Service's Boston laboratory a semifinal draft of standards of grading conditions for cooked fish sticks was completed. It is now being reviewed by industry producers and buyers for their comments. Scale models of cooked fish sticks showing salient characteristics, such as variations in size and shape and major defects, were prepared for use in the application of standards.

Cost of projects: $100,000 a year.

5. Development of a Quality Index for Fish Meals and the Devising of New Industrial Uses for Fish Oil: These projects will determine through research studies possible new uses for fish oils and develop a standard quality index for fish meals. The personnel required for the Service portion of the meal and oil research program were recruited and are now at work.

QUALITY INDEX FOR FISH MEALS: Agreement was reached on the following contracts for research on the quality index of fish meals: University of Delaware, short-term growth response and longer-term broiler feeding tests of screened meal samples; Maryland State College, nitrogen distribution studies of fish meals; and Reedville Oil and Guano Co., Reedville, Va., pilot-scale and commercial-plant studies.

NEW USES FOR FISH OILS: The fish oil research program was likewise firmed up through discussions with individual members of the industry. Basic research contract proposals under consideration include: University of Minnesota, chemistry of inclusion type complexes; University of Minnesota, composition of the unsaturated and saturated fractions in fish oils; and University of Minnesota, the chemistry of odors in fish oils.

APPLIED RESEARCH ON FISH OILS: A part of the research effort will be placed on the modification of oils for increased use in known fields or for the recovery of former markets lost to competing products. Among the proposals under consideration are: University of Cincinnati, application of fish oils in the leather trade: Florida Southern College, use of fish oils and metallic compound complexes as fungicides and insecticides for citrus orchards; University of Connecticut, evaluation of fish oils in high energy rations for chickens; North Carolina State College, determination of physical-chemical characteristics of fish body oils in different seasons and geographical locations; Texas A. & M. chromatography of fish oils; and Oregon State College, use of fish oils in swine rations.

MEAL AND OIL RESEARCH IN GENERAL: Arrangements were being completed for the use of pilot-scale reduction equipment in one of the principal menhaden processing plants as a part of the Service research program. Samples will be taken at the same time of the meal and

oil prepared from the full-scale commercial equipment in this plant. Samplings will also be taken routinely of oils produced at specified places throughout the entire United States. Analyses of these oils will provide valuable background information on the variability with locality, season, and type of equipment used.

Fish-meal sampling will be carried out on a somewhat similar basis at the reduction plant. Service staff members will study problems of heating and piled fish meal and in warehouse storage of sacked fish meal.

Cost of projects: $234,000 for first year.

6. Regular Educational and Market Development Program: These are existing programs formerly financed by the annual transfer of funds from the Department of Agriculture. The equivalent of the $175,000 was allocated for carrying out the same work as previously, which features market promotional activities, educational activities, and school-lunch demonstration programs.

EXAMPLES OF ACTIVITIES: School-lunch demonstrations, numbering 78, have been conducted in North Carolina, Virginia, Missouri, and Kentucky during this spring semester.

Two industry-financed Service-produced fishery educational motion pictures are in production. They are 16 mm. color sound films. One entitled Shrimp Tips from New Orleans is financed by a Gulf manufacturer of shrimp peeling machines; the other entitled Fishing with a Kicker is financed by two larger outboard motor manufacturers.

Exhibits were sponsored at the major food association conventions of the American Dietitians Association, American School Food Association, National Frozen Food Wholesalers Association, and the National Restaurant Association.

The preparation and publication of Commercial Fisheries Abstracts, Commercial Fisheries Outlook, "Fishery Notes," and "Test Kitchen Series" have proceeded according to schedule.

The program is completely staffed and on schedule.

Cost of project: $167,000 a year.

EXPANSION OF REGULAR EDUCATIONAL AND MARKET DEVELOPMENT PROGRAM: An additional allocation expands the regular programs. It is primarily for increasing in number and scope the school-lunch demonstration program, for increasing the emphasis on promoting the purchase of fish through locker plants, and for conducting special marketing programs to aid segments of the fishing industry that are faced with excessive inventories.

A contract was awarded to the University of Miami Marine Laboratory to study the development of new markets for Florida fishery products. It is well under way.

Beginning in January a special industry-government special marketing program was undertaken to aid the distressed Boston haddock industry. As a result of the program, cold-storage stocks in Boston dropped almost 45 percent from January 1 to March 30.

A similar industry-government cooperative marketing program had been started with the Pacific Coast tuna canning industry, in which the industry will concentrate on consumer markets and the Service will concentrate on institutional markets.

Arrangements for similar programs are under consideration for the halibut and shrimp industries.

The school-lunch program is being expanded in the Pacific Coast, Gulf, and Middle Atlantic States.

All programs are well under way and all vacant personnel positions have been filled.

Cost of expansion: $85,000 a year.

7. Information on Foreign Production, Marketing, and Technical Advances in the Field of Fishery Products: These projects will assist domestic producers of fishery products to compete more effectively with imports of foreign fishery

products and to develop and reestablish foreign markets.

A unit has been established and work is under way to improve the receipt and analysis of foreign consular dispatches and other sources of information on foreign production, processing techniques, and markets.

Arrangements have been made to have specialists in the Department of Agriculture conduct special investigations of foreign production facilities and markets for fishery products while on related projects in foreign countries.

Cost of project: $48,000 a year.

8. Surveys on Fish Consumption and Industry Segments: An economic survey of the shrimp industry is well under way. Field work has commenced for the purpose of obtaining foreign and domestic costs of production. This work is being done by the Federal Trade Commission. Contracts with nongovernmental organizations are under consideration or have been let to cover the following types of survey work with the indicated organizations: Harwell, Knowles and Associates, Inc., Coral Gables, Fla., survey of efficiency of shrimp vessel; First Research Corporation, Inc., Miami, Fla., survey of efficiency of processing plants in the shrimp industry; University of Miami, Coral Gables, Fla., economic analysis of production and primary marketing operations in the shrimp industry; A. C. Nielsen Co., Chicago, Ill., survey of secondary distributors and retailers of shrimp products to obtain suggestions for improving marketing conditions.

These proposals are under consideration: First Research Corporation, Inc., Miami, Fla., time and motion studies of shrimp fishing; Northeastern University, Boston, Mass., economic analysis of freezing fish at sea in the New England fisheries; Bureau of the Census, fish consumption in public eating places (a questionnaire form has been pretested; Census Bureau will survey approximately 4,000 public eating places to determine the answers to various problems in marketing fish and shellfish among these outlets).

Cost of projects: $143,000 a year.

9. Increased Coverage and More Rapid Collection and Release of Fishery Statistics: These programs will speed up the existing procedures in the collection, tabulation, and publication of fishery statistics; increase the coverage of inland fisheries and obtain more detailed statistics on shrimp in the South Atlantic and Gulf area for biological and marketing uses.

Supervisory personnel have been employed in Washington to help expedite compilation and issuance of statistics. Additional personnel have been employed in the Mississippi River, South Atlantic, Eastern Gulf, and Pacific Coast areas. Employment of personnel required to complete the Section's staff is proceeding as rapidly as suitable employees can be located.

Bulletins on the domestic production of canned fishery products, byproducts, and packaged fish already were released several months earlier than has been possible in previous years.

A contract for expediting tabulation of production data is under consideration with the State of California.

Arrangements were made for collection and joint state-Federal publication of monthly statistics on landings of fishery products in the states of North Carolina and Georgia. Release of these data will begin during the summer.

Full cooperation has been sought and in most cases received from state fishery agencies in this program.

Cost of project: $160,000 a year.

10. Study of Improvement of Cold-Storage Statistics: This project will investigate means of improving the collection of statistics on the freezing and holdings of fishery products and expedite their issuance in a monthly bulletin which is widely used by the trade.

To aid the Service the National Fisheries Institute has conducted, without charge, a preliminary survey to determine the effectiveness of the present coverage. In-

formation has been obtained on the number of firms not submitting data on their freezings and holdings. Arrangements have been made for the temporary employment of a man who has many years' experience in the fishing industry, and is well acquainted with the need for and use of cold-storage information. He will conduct a detailed survey of the collection and publication of fishery cold-storage information and prepare recommendations for improving the monthly cold-storage report.

Cost of project: $5,000 for first year.

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PROGRESS ON BRANCH OF FISHERY BIOLOGY PROJECTS (MAY 1955): The status, as of mid-May 1955, of the various Saltonstall-Kennedy Act projects under way in the Service's Branch of Fishery Biology is as follows:

1. Research on the Identity of Stocks of Salmon in the High Seas of the North Pacific: A senior biologist has been engaged to take charge of the sampling program on the high seas and ashore. Arrangements have been made with the Japanese Government and fishing companies for biologists to work aboard the Japanese high-seas fleet in 1955.

Preliminary results from serological research on the identity of salmon stocks have been encouraging. Red-cell samples produced antisera in laboratory animals which showed differences according to geographical origin of the salmon from which the blood was taken.

Growth patterns of ridges on salmon scales have also exhibited differences according to geographical origin of the fish. Spectroscopic examination of scales from young salmon fed bismuth distinguishes them from fish fed a normal diet, indicating a method of marking young fish for subsequent identification when caught on the high seas.

The research vessel John N. Cobb has been readied for experimental fishing, and fishing gear is being assembled.

A contract was awarded the Fisheries Research Institute of the University of Washington for a high-seas tagging program. It is understood that the Institute has made preliminary arrangements for charter of a vessel and procurement of supplies.

A contract has been let to the University of British Columbia for research leading to identification of salmon runs by means of scales.

Cost of project: $130,000 for initial year.

2. Research on the King Crab of the Bering Sea: All preliminary work for the 1955 research at sea was accomplished. Bids were secured for charter of a vessel. A pattern of stations for experimental crab fishing has been laid out.

Cost of project: $50,000 for initial year.

3. Research to Develop Methods of Controlling Oyster Predators and to Improve Efficiency of Seed Collection: The staffs of the Milford, Conn.; Annapolis, Md.; and Pensacola, Fla.; shellfish research laboratories have been increased by the employment of four biologists and a statistician in order to provide personnel to carry out the project. A contract was let to a chemical firm to provide substances for use in developing a drill control agent.

A contract was awarded the Florida State University for a survey of predators on oyster reefs in the Gulf of Mexico. Also, a contract is being negotiated with the Texas A. and M. Research Foundation for a survey of the currents near Pensacola, leading to the determination of better locations for the attachment and growth of oyster spat.

Cost of project: $75,000 a year.

4. Atlantic Herring Research--Boothbay Harbor, Me.: Available biological and statistical information concerning the Atlantic herring is being reviewed and a report is being prepared in collaboration with Canadian investigators. Knowl-

edge to date will be used for design and conduct of future research.

Samples of herring were obtained from New Jersey, Rhode Island, Connecticut, Maine, Massachusetts, and New Brunswick for analysis to detect races or subpopulations.

The research vessel T. N. Gill was was assigned to the herring project and was outfitted for biological and scouting surveys to determine the annual distribution and abundance of herring and to obtain samples from offshore areas.

Eight of eleven staff members were recruited. Cost of project: $74,000 for first year.

5. North Atlantic Trawl Fish Investigations--Woods Hole, Mass.: WHITING: Mesh selectivity experiments were conducted to determine the mesh size required to catch whiting of various sizes. Results show that marketable sizes can be caught without catching or harming smaller fish. Methods of aging whiting are being studied and use of scales appears to be a promising method.

OCEAN PERCH: Analysis of ocean perch catch statistics shows that catch per unit of effort in the Gulf of Maine for 1954 was 7.4 thousand pounds per day which is near the average for the last five years. Methods of age analysis of ocean perch have been perfected. Current work is directed towards obtaining a reliable measure of yearly brood size through sampling and age analysis.

SEA SCALLOPS: Present knowledge of scallop biology was reviewed. Equipment, such as an underwater camera, dredges, and tags, was designed and is being procured.

The research vessel Albatross III was dry-docked, equipped, and placed in operation. Three cruises to Georges Bank and the Gulf of Maine were completed.

Project leaders and staff biologists for new projects were recruited. Cost of these projects: $206,000 for first year.

6. Atlantic Menhaden--Beaufort, N. C.: Headquarters were established at Beaufort, N. C. A sampling and age analysis program was being developed to determine relative size of year broods. A series of menhaden larvae, in graduated sizes, is being collected for use in identifying later collections. Tows with fine meshed nets are made biweekly at Indian River, Del.

Staff partially recruited. Two biologists and a statistician of a staff of seven plus several seasonal aids are to be recruited.

Cost of project: $33,000 for FY 1955.

7. Florida Red-Tide Studies--Fort Myers, Fla.; and Galveston, Tex.: Sampling for Gymnodinimum brevis, the microoganism which causes fish kills, was increased through use of a float plane. Trial flights have shown that water samples can be easily and quickly obtained by landing in the inside water. Red-tide outbreaks will be detected in early stages by the intensive sampling and patrol. G. brevis distribution is now limited to one small area off Everglades, Fla.

The research vessel Kingfish was operated on observational and sampling cruises during the past year.

Cost of project: $53,000 for first year.

8. Gulf of Mexico Shrimp Studies--Galveston, Tex.: Research, by contract, was under way to develop techniques for marking shrimp and to identify shrimp from different areas by anatomical means. Field and laboratory studies were started to determine conditions which govern shrimp survival and development from the egg to the adult.

Five staff members were added. Experimental equipment was obtained.

Cost of project: $80,000 for first year.

9. Pacific Sardines and Related Studies--La Jolla, Calif.: The research vessel

Black Douglas was placed on operation after being laid up for three years. Surveys indicate that fair numbers of sardines are spawning in Southern California waters this spring. Last year a relation between spring spawning and the fall catch was noted. If the same relation holds this year, the catch of sardines off Southern California should be 60,000 tons or greater.

Research cruises are being continued in cooperation with the California Department of Fish and Game and the Scripps Institution of Oceanography.

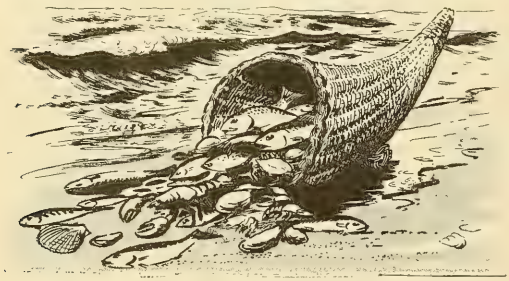
Cost of project: $125,000 a year.

10. North Pacific Albacore Studies--Honolulu, Hawaii: Four cruises were conducted in waters north of Hawaii to define the distribution and abundance of albacore tuna. Results to date indicate that albacore are located in areas where currents converge and where the temperature change is most rapid from south to north. Albacore have been caught consistently in these areas but not in commercial quantities.

Cost of project: $234,000 a year for vessel operation.

U. S. Canned Fish and Byproducts--1954

United States (including Alaska, American Samoa, Hawaii, and Puerto Rico) production of canned fishery products and byproducts registered healthy advances in both quantity and value in 1954, according to an annual summary report (canned fish and byproducts--1954, C.F.S. No. 1127) released May 5 by the U. S. Fish and Wildlife Service.



The 1954 pack of canned fishery products processed in 400 plants in 25 States and in Alaska, American Samoa, Hawaii, and Puerto Rico, amounted to 868 million pounds and was valued at $331 million to the packers. This is an increase of 10 percent in quantity and 8 percent in value as compared with the previous year.

Fishery byproducts in 1954 were valued at $82 million, a gain of 10 percent over 1953.

The 1954 gain in production in canned items can be attributed to increased packs of tuna, Maine and Pacific sardines, salmon, and the fish packed for pet food.

The pack of tuna and tunalike fishes exceeded that of any other item in both quantity and value, and amounted to almost 11 million standard cases (214 million pounds), valued at $142 million. Compared with 1953, this was an increase of over 1 million standard cases in quantity, and almost $16 million in value. The tuna pack was worth 54 percent more than that of salmon which ranked second in value. Tuna was packed in seven States, Hawaii, Puerto Rico, and (for the first year) American Samoa.

The pack of canned salmon in 1954 amounted to 4 million standard cases (200 million pounds), valued at $92 million to the canners--an increase of 6 percent in quantity and 11 percent in value as compared with 1953. The largest pack of sockeye salmon in the Puget Sound area since 1913 and an unusually large pack of chum salmon in southeastern Alaska were responsible for the gain.

Pacific sardines returned to southern California waters in 1954 after an almost complete absence during 1952 and 1953. The catch of 133 million pounds was used to produce a pack of over 1 million standard cases (60 million pounds), compared with less than 64,000 cases in 1953. Had there been a market for additional supplies of canned sardines, it is estimated that the pack could have been doubled.

The pack of Maine sardines amounted to almost 3 million standard cases (60 million pounds), valued at $18 million to the packers. Compared with the previous year, this represented an increase of 5 percent in quantity and 7 percent in value.

VALUE OF CANNED FISH AND BYPRODUCTS 1934 - 1954

YEAR	CANNED	BYPRODUCTS	TOTAL
1954. . .	$331,026,000	$81,571,000	$412,597,000
1953. . .	306,873,674	74,371,996	381,245,670
1952. . .	305,829,198	67,991,631	373,820,829
1951. . .	301,210,295	69,313,027	370,523,322
1950. . .	331,335,347	77,188,366	408,523,713
1949. . .	295,503,905	78,472,495	373,976,400
1948. . .	336,181,000	79,866,000	416,027,000
1947. . .	310,679,000	80,592,000	391,271,000
1946. . .	227,629,000	76,643,000	304,272,000
1945. . .	152,800,000	58,211,000	211,011,000
1944. . .	152,914,000	63,299,000	216,213,000
1943. . .	141,189,000	59,136,000	200,325,000
1942. . .	144,997,000	50,897,000	195,894,000
1941. . .	138,684,000	56,801,000	195,485,000
1940. . .	94,182,000	30,554,000	124,736,000
1939. . .	96,627,000	34,039,000	130,666,000
1938. . .	83,446,000	30,576,000	114,022,000
1937. . .	105,175,000	36,804,000	141,979,000
1936. . .	94,564,000	34,969,000	129,533,000
1935. . .	74,999,000	29,520,000	104,519,000
1934. . .	80,021,000	22,598,000	102,619,000

In the byproducts field a new record was attained through the production of 256,915 ton of fish meal worth $33 million. This was nearly 18,000 tons more than in 1953 and 13,000 tons above the previous record production in 1936.

The production of marine-animal oils in the United States and Alaska during 1954 amounted to 22 million gallons, valued at $13 million to the producers. This was an increase of 9 percent in quantity as compared with 1953, but was only 55 percent of the record 1936 production when 40 million gallons of oils were produced.

Other important byproducts produced during the year were marine pearl-shell, oyster-shell, and fresh-water products valued at $16 million. Byproducts were manufactured in 227 plants in 25 States, Alaska, American Samoa, and Puerto Rico in 1954.

The Service's Branch of Commercial Fisheries has made annual statistical surveys of the domestic production of canned fishery products and byproducts since 1921. The data collected include statistics on the production and value of each canned commodity by can sizes and trade classification.

U. S. Fish-Stick Production, January-March 1955

United States production of fish sticks continued to rise during the first quarter of 1955, reaching a total of 18.0 million pounds, according to Fish Stick Report, January-March (C.F.S. No. 1132), published by the U. S. Fish and Wildlife Service (see table). This was 8.0 million pounds more than was produced during the same period of 1954 and 2.7 million pounds more than the production during the last quarter of 1954.

U. S. Fish-Stick Production, Jan.-Mar. 1955 and 1954

Month	Cooked		Uncooked		Total	
	1955	1954	1955	1954	1955	1954
	(Millions of Pounds)					
January	4.4	2.5	.7	.3	5.1	2.8
February	4.9	2.9	.9	.3	5.8	3.2
March	6.2	3.6	.9	.4	7.1	4.0
Total	15.5	9.0	2.5	1.0	18.0	10.0

A total of 5.1 million pounds was packed during January, 5.8 million pounds during February, and 7.1 million pounds during March. The largest amount previously reported was in October 1954--5.6 million pounds.

During the first quarter of 1955, 86 percent of the fish sticks were precooked. This was only a slightly smaller proportion than the 87 percent reported during the entire previous year.

This bulletin, the first in a series is available free from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.

U. S. Foreign Trade

EDIBLE FISHERY PRODUCTS, FEBRUARY 1955: United States imports of fresh, frozen, and processed edible fish and shellfish in February 1955 amounted to 55.4 million pounds (valued at $13.6 million), according to a Department of Commerce summary tabulation (see table). This was an increase of 1 percent in quantity but a decrease of 4 percent in value as compared with January imports of 54.9 million pounds (valued at $14.2 million). Compared with a year earlier, February imports were about the same in quantity but 7 percent less in value.

United States Foreign Trade in Edible Fishery Products, February 1955 with Comparisons

Item	Feb. 1955		Feb. 1954		Year 1954	
	Quantity	Value	Quantity	Value	Quantity	Value
	(In Millions of Lbs. & $)					
Imports:						
Fish & shellfish: fresh, frozen, & processed 1/	55.4	13.6	55.4	14.7	801.7	202.8
Exports:						
Fish & shellfish: processed 1/ only (excluding fresh and frozen)	6.7	1.5	2.4	0.8	50.8	13.2

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

Exports of processed edible fish and shellfish (excluding fresh and frozen) in February 1955 totaled 6.7 million pounds (valued at $1.5 million)--a decrease of 45 percent in quantity and 35 percent in value as compared with January exports of 12.2 million pounds (valued at $2.3 million). February exports were higher by 179 percent in quantity and 88 percent in value as compared with a year earlier, due to larger exports of California sardines.

Virginia

OYSTER GROUNDS INVESTIGATIONS IN HAMPTON ROADS: The Virginia Fisheries Laboratory and the Chesapeake Bay Institute are conducting a joint investigation of oyster grounds in the Hampton Roads area. The Virginia Department of Highways has employed a construction firm to build a combination bridge and tunnel across this famous waterway to link the Newport News area with Norfolk.

Two large artificial islands are being built, one on each side of the ship channel, each to be joined to the adjacent shore by a bridge. The tunnel, which will cross the channel from one island to the other, is to be made of precast sections which will be laid in a dredged trench and covered with sand.

This bridge-tunnel crosses or adjoins some of the most productive oyster bottom in Virginia. The oystermen have voiced concern that their oysters may be damaged or their grounds destroyed by deposition of silt during the dredging operations. The two laboratories are making studies to determine the transport of silt from the dredging operations, and to investigate the effects, if any, upon the oysters. The results of the work should have far-reaching application in other problems of a similar nature.

Wholesale Prices, April 1955

Increased production and lighter demand for fresh and frozen fish and shellfish caused a further drop in wholesale prices from March to April. The over-all index of edible fish and shellfish (fresh, frozen, and canned) in April 1955 was 98.7 percent of the 1947-49 average (see table)--2.0 percent less than in March and 6.6 percent below April 1954.

Lower prices for Western halibut, salmon, and yellow pike at New York in April 1955 more than offset higher prices for large haddock at Boston and most fresh-

Table 1 - Wolesale Average Prices and Indexes for Edible Fish and Shellfish, April 1955 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Apr. 1955	Mar. 1955	Apr. 1955	Mar. 1955	Feb. 1955	Apr. 1954
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					98.7	100.7	101.8	105.7
Fresh & Frozen Fishery Products:					98.1	101.1	103.0	109.8
Drawn, Dressed, or Whole Finfish:					89.1	96.3	100.4	111.8
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.06	.06	64.2	60.3	80.8	76.6
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.22	.24	68.1	74.8	79.4	94.9
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.50	.53	112.4	118.0	119.7	120.2
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.73	.68	179.7	167.3	161.1	241.7
Whitefish, L. Erie pound or gill net,rnd., fresh	New York	lb.	.75	.65	151.6	131.4	96.0	313.5
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.69	.68	141.4	139.3	133.2	166.0
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.28	.69	64.5	161.8	123.1	129.0
Processed,Fresh (Fish & Shellfish):					105.2	104.2	104.3	111.1
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.26	.23	88.5	78.3	100.4	95.3
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.64	.62	101.1	98.0	91.7	109.1
Oysters, shucked, standards	Norfolk	gal.	4.63	4.75	114.4	117.5	120.6	117.5
Processed, Frozen (Fish & Shellfish):					95.3	96.8	97.4	99.4
Fillets: Flounder (yellowtail), skinless, 1-lb. pkg.	Boston	lb.	.42	.41	110.0	106.0	104.7	98.2
Haddock, sml.,skins on, 1-lb. pkg.	Boston	lb.	.28	.29	86.3	89.4	89.4	102.0
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.28	.28	111.8	111.8	111.8	117.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.55	.56	84.1	85.6	86.8	88.0
Canned Fishery Products:					99.4	100.0	100.0	99.6
Salmon, pink, No. 1 tall (16 oz.), 48 can/cs.	Seattle	case	20.70	20.70	109.6	109.6	109.6	99.1
Tuna, lt. meat, chunk, No. 1/2 tuna (8-1/2 oz.), 48 cans/cs.	Los Angeles	case	12.70	12.90	91.6	93.0	93.0	102.4
Sardines, Calif., tom. pack, No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	case	7.30	7.30	85.2	85.2	85.2	2/
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	case	7.20	7.20	76.6	76.6	76.6	87.3

1/Represent average prices for one day (Monday or Tuesday) during the week in which the 15th of the month occurs. These prices are published as indicators of movement and not necessarily absolute level. Daily Market News Service "Fishery Products Reports" should be referred to for actual prices.
2/Not available.

water varieties at New York and Chicago. This accounted for the 7.5-percent decline in the drawn, dressed, or whole finfish subgroup index from March to April 1955. Compared with April 1954, all items were considerably lower in April 1955 and the index for the subgroup was down 10.3 percent.

Boxes of fish stacked up in the shipping and receiving room of a wholesale firm in Chicago's Fulton Market.

Fresh haddock fillet prices rose from March to April, the first increase for some months, due to improved demand. Fresh shrimp prices were also higher as production continued good and demand improved. Oyster prices were down slightly from the previous month because the season drew to a close at the end of April. The April 1955 index for the fresh processed fish and shellfish subgroup was 1.0-percent higher than March but 5.3 percent below April 1954.

Lower prices for frozen haddock fillets and frozen shrimp caused a 1.5-percent decline from March to April in the index for frozen processed fish and shellfish. Flounder fillets were priced higher in April, while ocean perch fillet prices remained unchanged. April 1955 prices for frozen processed fish and shellfish were down 4.1 percent as compared with a year earlier--prices for all items were lower except flounder fillets which were priced considerably higher.

The only price change from March to April in the canned fishery products subgroup was a slight drop for tuna; all other items were the same. Canned tuna inventories are reported heavy. Compared with the same month a year earlier, April prices for tuna and Maine sardines were substantially lower and salmon prices were significantly higher.

IRISH MOSS

"Irish Moss" is the trade name for the seaweed, Chondrus crispus, which is used commercially in the manufacture of carageenin. Carageenin is used in the making of prepared foods, drugs, and cosmetics, as it has remarkable thickening, suspending, emulsifying, gelling, and stabilizing powers. At present its most important use is as a stabilizer in chocolate milk. It is also used in prepared cheeses, ice-cream toppings, salad dressings, syrups, puddings, candies, etc. Irish moss was originally imported from Europe, but in 1835 was discovered in abundance along the rocky shores of Massachusetts. It is found in quantity along the Atlantic coast from New Jersey to Newfoundland.

--Sea Secrets, July 20, 1954
The Marine Laboratory, University of Miami,
Coral Gables, Florida.

International

INTERNATIONAL PERMANENT COMMITTEE ON CANNED FOODS

MEETING AT GOTEBORG, SWEDEN, IN 1954: The 1954 meeting of the International Permanent Committee on Canned Foods (CIPC) took place at the Swedish Institute for Food Preservation Research, Kalleback, Goteborg, Sweden, from September 27-October 25, 1954.

There were some 50 delegates and advisers from Belgium, France, West Germany, Morocco, the Netherlands, Portugal, Sweden, Switzerland, and the United Kingdom, and observers from Denmark, Norway, the Tin Research Institute, and the Food and Agriculture Organization (FAO).

The program covered a 4-day meeting during which the delegates split up into standing commissions. These include among others the Scientific Commission, Commission for Standardization of Cans for Fish, and Commission for the Regulation and Definition of Canned Fish.

Scientific Commission: Under the heading "Bacteriology," research work carried out in a number of member countries on the bacteriology of semipreserved marinades, on sterilization of spices and on bacteriological definitions of canned foods, e. g. semipreserved canned hams, was discussed.

Under the heading "Standardization of Analytical Methods," the determination of dry matter in tomato pastes, and of total nitrogen, tin, and small quantities of SO_2 in canned foods, was discussed, as well as ways and means of cooperating with the American Association of Official Agricultural Chemists (AOAC) work of standardizing analytical methods.

The CIPC has made an "International Survey of the National Legislations on the Use of Preservatives in Foods." This survey will be published in the near future. A similar survey on the use of artificial coloring in foods has also been made, but publication will be delayed as many countries are amending their legislation in this field. Both surveys will be issued in loose-leaf form.

Commission for Standardization of Cans for Fish: A list of 12 sizes (capacity in milliliters) for round cans ranging from 85 to 1,700 ml. was approved for recommendation to the International Organization for Standardization (ISO).

In addition to the already standardized rectangular "Club 125" can, the so-called 1/15 P can was discussed and a standard capacity of 50 ml. $\pm$ 5% was adopted, and a length of 97 $\pm$ 2 mm. and width of 44 $\pm$ 2 mm. was recommended.

It was decided to give further study to the standardization of the $\frac{1}{4}$ Dingley can and a standard capacity of 118 ml. $\pm$ 5% was suggested.

Commission for the Regulation and Definition of Canned Fish: In this Commission, problems of using frozen sardines for subsequent canning were discussed, as

well as the necessity of standardizing declarations of weight of contents on the labels of canned fish, the necessity of standardization of the definition of marinades in various languages, the definitions of tunas, and the use of preservatives in the handling and processing of fish for subsequent canning.

Commission for the Organization of the Third International Congress on Canned Foods: This Congress will take place in September 1956 in Italy, in conjunction with the Canned Foods and Packaging Fair of Parma. The Canning Congress may be held in Rome or Parma depending on the decision of the host country. A five-day meeting is planned and the tentative program was established after a lengthy discussion. This will cover summaries of reports on the CIPC activities, reports on advances in canning technology, sessions on packaging (containers) and machinery methodology of market investigations, economics of canning, waste and pollution problems, public health and educational (propaganda) aspects, canned foods and nutrition, and finally, bacteriological problems and definition of canned foods.

FAO/CIPC Relations: The FAO observer took part in the discussion of the Scientific Commission and the Commission for the Regulation and Definition of Canned Fish when FAO/CIPC cooperation was informally discussed. A more formal discussion had been planned for the final plenary meeting, but had to be postponed till the next session of the CIPC which is to take place in Paris in the autumn of 1955.

Nutrition Symposium: Following the CIPC meeting, the Swedish Institute for Food Preservation Research organized a 3-day symposium on "Nutritive Aspects of Preserved Food," with over 20 contributors of reports and over 60 participants from Denmark, France, West Germany, Norway, Sweden, Switzerland, United Kingdom, and the United States. The reports, but not the discussions, will probably be issued in printed form at a later date, reports the January-March FAO Fisheries Bulletin.

TERRITORIAL WATERS

COMMISSION TO STUDY ICELANDIC-BRITISH FISHING CONFLICT: A solution to the conflict between Iceland and British fishing interests which has lasted for more than four years will be sought by the Office of European Economic Cooperation (OEEC), reports the February 18 International Financial News Survey. A commission will be appointed consisting of two representatives from the United Kingdom and two from Iceland, with a neutral chairman.

The origin of the conflict was the extension by Iceland in 1950 of her exclusive fishery limits. Since the new limits excluded all trawling (Icelandic and foreign) on certain fishing banks, the trawlers were especially affected. As a reprisal, British trawling interests boycotted Icelandic trawlers, which have not been able to land fish in British ports since.

TRADE AGREEMENTS

GATT NINTH SESSION CLOSED MARCH 7: The Ninth Session of the Contracting Parties to the General Agreement on Tariffs and Trade (GATT) which convened in Geneva on October 28, 1954, closed March 7, 1955, the Department of State announced. Representatives of the contracting parties completed the review of the General Agreement, which began on November 8, and the drafting of:

(1) An agreement establishing an organization for trade cooperation to administer the GATT and to facilitate consultation and study of matters relating to international trade;

(2) Amendments of the trade rules contained in the General Agreement;

(3) Technical amendments of the General Agreement to give effect to the transfer of its organizational provisions to the proposed new organization for trade cooperation; and

(4) A declaration extending from June 30, 1955, to January 1, 1958, the firm life of the tariff concessions previously negotiated by the contracting parties which are an integral part of the General Agreement.

The text of the Agreement on the Organization for Trade Cooperation and the texts of other documents will be authenticated, and will be open in Geneva for signature by governments.

The GATT is the principal instrument through which the United States has carried out the provisions and purposes of the Trade Agreements Act. It is a multilateral trade agreement among 34 nations, including practically all major trading countries accounting for approximately 80 percent of world trade. Negotiations looking toward the accession of Japan to the GATT are now under way.

United States participation in the review session of the Contracting Parties to the GATT afforded opportunity to carry out the recommendation of the President's Commission on Foreign Economic Policy that the organizational provisions of the GATT be renegotiated with a view to providing an organization to sponsor multilateral trade negotiations, to recommend broad trade policies, and to provide a forum for consultation regarding trade matters, and that the organizational provisions so renegotiated be submitted to the Congress for approval. In his message to Congress on foreign economic policy of March 30, 1954, President Eisenhower signified his intention to act promptly on these recommendations and to seek to negotiate certain revisions of the trade rules of the General Agreement to provide a simpler and stronger instrument.

The decision was made by the contracting parties in October 1953 to convene a session in the fall of 1954, "to review the operation of the General Agreement upon the basis of experience gained since it has been in provisional operation, and in the light of this review to examine to what extent it would be desirable to amend or supplement existing provisions of the Agreement and what modifications should be made in arrangements for its administration."

The Contracting Parties agreed to convene the Tenth Session on October 27, 1955, at Geneva.

Tariff negotiations involving Japan and certain other negotiations with contracting parties to the GATT convened at Geneva on February 21, 1955.

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PUBLIC ADVISERS TO U. S. GATT DELEGATION APPOINTED: The designation of four public advisers to the United States Delegation at Geneva which conducted tariff negotiations with Japan and other countries, was announced April 16 by the State Department.

The United States officials on the negotiating delegation represent nine executive agencies and departments of the government. It is expected that this delegation will be materially aided by the broad experience and judgment of the public advisers just appointed.

The negotiations at Geneva are being conducted between the United States and Japan, on the one hand, and between the United States and third countries which are negotiating with the Japanese under the auspices of the General Agreement on Tariffs and Trade (GATT). Upon conclusion of the negotiations, Japan is expected to become

a full-fledged participant in the General Agreement. At present Japan is participating on a provisional basis.

The public advisers arrived in Geneva about April 24. They were: R. G. Smith, executive vice-president in charge of international operations of the Bank of America; L. F. Whittemore, Chairman of the board of directors of Brown Company, pulp and paper manufacturers of Berlin, N. H.; A. B. Kline, former President of the American Farm Bureau Federation; B. Seidman, Staff Economist for the American Federation of Labor.

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AGREEMENT ON ORGANIZATION FOR TRADE COOPERATION AND AMENDMENTS TO GATT: Assistant Secretary of State Samuel C. Waugh on March 21 signed on behalf of the United States in Geneva, Switzerland, the documents incorporating the results of the review of the General Agreement on Tariffs and Trade (GATT). The GATT is an international trade agreement adhered to by 34 countries, reports a March 21 release from the Department of State.

The most important of the documents is an agreement establishing an Organization for Trade Cooperation to administer the GATT. Mr. Waugh's signature of the Agreement was conditional on Congressional approval of United States membership in the Organization.

In addition to the Agreement establishing the OTC, Waugh also signed several protocols amending the trade rules contained in the General Agreement itself. The Department of State is preparing and plans shortly to publish the texts of the amendments showing their relationship to the GATT.

The Agreement on the Organization for Trade Cooperation is intended primarily to provide permanent arrangements for the administration of the GATT. The negotiation of the OTC Agreement was a fulfillment of that part of the President's message to the Congress on March 30, 1954, in which he said the United States would seek the renegotiation of the GATT's organizational provisions and that he would submit them to the Congress for its approval.

Under the new arrangements functions formerly exercised jointly by the countries party to the Agreement, in their informal periodic meetings, would be transferred to the Organization for Trade Cooperation. In addition, the Organization would be empowered to sponsor international trade negotiations and to serve as an intergovernmental forum for the discussion and solution of other questions relating to international trade. The Organization's structure would include an Assembly, consisting of all the countries party to the GATT. There would also be an Executive Committee to which the Assembly would delegate powers to handle problems arising between sessions of the Assembly. Under the criteria for election to the Executive Committee, which will consist of 17 members, the United States is assured of a permanent seat on the Committee.

The establishment of the OTC constitutes recognition by countries representing more than 80 percent of the world's trade that expansion of international trade requires cooperative international action to remove trade barriers. The creation of a permanent body to administer the GATT would also make possible the better enforcement of the trade rules protecting the more than 50,000 tariff concessions that have been negotiated and incorporated in the Agreement. The OTC would also facilitate settlement of trade disputes which could give rise to international tensions in the free world.

The Geneva Conference reaffirmed the basic objectives and obligations included in the GATT, including the principle of nondiscriminations in international trade.

The general prohibition against the use of quantitative restrictions on imports was also confirmed.

One of the major achievements of the conference was agreement to extend the assured life of the tariff concessions beyond June 30, 1955, the present expiration date. The assured life of the concessions would be extended to December 31, 1957. Provisions were also written into the Agreement for the future automatic continuance of the concessions for three-year periods after December 31, 1957. Arrangements were made to allow in special circumstances the renegotiation of concessions during this period.

The Agreement on the Organization for Trade Cooperation provides in part:

The Organization shall administer the General Agreement and generally facilitate the operation of that Agreement. Organization shall have the following functions: (1) Facilitate intergovernmental consultations on questions relating to international trade; (2) Sponsor international trade negotiations; (3) Study questions of international trade and commercial policy and, where appropriate, make recommendations thereon; (4) To collect, analyze, and publish information and statistical data relating to international trade and commercial policy, due regard being paid to the activities in this field of other international bodies.

The Assembly shall appoint a Director-General as chief administrative officer of the Organization. The powers, duties, conditions of service, and term of office of the Director-General shall conform to regulations approved by the Assembly. The Director-General shall appoint the members of the staff, and shall fix their duties and conditions of service in accordance with regulations approved by the Assembly.

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DANISH-ARGENTINE AGREEMENT INCLUDES COD: Denmark will ship to Argentina cod valued at US$15,000 in the first year of a five-year trade agreement signed by the two countries in Buenos Aires February 18. No fishery products shipments from Argentine to Denmark are included in the agreement, reports an April 6 U. S. Embassy dispatch from Buenos Aires.

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NORWEGIAN-EAST GERMAN AGREEMENT INCLUDES FISHERY PRODUCTS: A global compensation agreement for 1955 involving fishery products between Norway and East Germany was recently concluded in Berlin between Norsk Kompensasjonsselskap A/S and Deutscher Innen-und Aussenhandel. Substantial increases in Norwegian exports to East Germany for canned fish and other items are offset by decreases in fresh and frozen fish and herring meal.

Norwegian export to East Germany in 1955 will include the following fishery products: fresh winter herring, valued at 7.9 million kroner (US$1.1 million); frozen winter herring for March-July delivery, 8.2 million kroner (US$1.2 million); fresh and frozen fish, delivery from May, 5.7 million kroner (US$0.8 million); salted herring for March-November delivery, 8.4 million kroner (US$1.2 million); canned fish for delivery in the 3rd and 4th quarters, 9.7 million kroner (US$1.4 million); herring meal, 1.5 million kroner (US$0.2 million); mackerel meal, 0.7 million kroner (US$98,000); pearlessence, 0.4 million kroner (US$49,000).

No fishery products are included in the agreement for shipment from East Germany to Norway.

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NORWEGIAN-ISRAEL AGREEMENT INCLUDES FISHERY PRODUCTS: A trade agreement between Norway and Israel for the period May 7, 1955, to May 6, 1956, was signed in Oslo April 13, and includes Norwegian exports of frozen fish, herring, and canned fish. Israel will not ship any fishery products to Norway, states an April 15 U. S. Embassy dispatch from Oslo.

UNITED NATIONS

ROME MEETING ON WORLDWIDE FISHERIES CONSERVATION OPENS: Experts from countries in many parts of the world gathered at the headquarters of the Food and Agriculture Organization of the United Nations in Rome, Italy, April 18 for the opening of a 2- to 3-week United Nations conference on "the conservation of the living resources of the sea." When the conference was first discussed in the U. N. General Assembly last winter, the narrower word "fisheries" was used, but this was changed to "living resources of the sea" in order to cover the whole broad field of marine life, ranging from whales to seaweed.

The main purpose of the conference was to examine all fishery conservation techniques, both national and international, which have been employed to date, and then to see how they can be applied in areas where conservation is needed but where little or nothing has so far been done.

The conference was opened in the name of Secretary-General Dag Hammarskjold by his special representative for the occasion, Adrian Pelt, Director of the European Office of the United Nations in Geneva. Pelt emphasized the Secretary-General's interest in the solution of the problem, and the importance he attaches to the spread of modern techniques.

Some of the 50 or so governments expected to attend were represented by their ambassadors in Rome. Others, notably countries with important fishing interests, sent technical experts.

The urgency of the matters confronting the delegates may be gathered from a study of the Assembly's proceedings, and a glance at some of the findings made public by FAO.

The question of fishery conservation was brought to the Assembly by a number of nations, including such maritime powers as Brazil, Netherlands, United Kingdom, and the United States. In their request for immediate Assembly consideration, these countries stressed the need for giving prompt attention to the technical aspects of the fishery conservation problem without waiting for the U. N. International Law Commission to complete its work on the legal aspects, a task which the Commission is undertaking as part of its codification of the law of the high seas and of territorial waters.

The Commission itself noted the immediacy of the issue when it pointed out in its most recent report on the subject that existing international law "provides no adequate protection of marine fauna against extermination." This, it emphasized, "constitutes a danger to the food supply of the world."

After a debate in which stress was laid on the fact that the world's fish catch was decreasing despite improved modern fishing methods, the Assembly's Legal Committee agreed to the wish of the requesting countries that a conference be held in April at FAO's Rome Headquarters. Throughout the debate emphasis was laid on the fact that the conference was to be of a strictly technical nature which would

not encroach in any way upon the Law Commission's work in the legal field. Several speakers expressed the belief that the views of the economic and technical experts attending the conference would be of great value to the Assembly when it ultimately considered the draft Articles on Fisheries which the Commission is formulating.

In the current issue of its monthly publication Memo, FAO discusses the situation in an article entitled "Plenty of Food in the Waters." Declaring that "the world's water areas, although covering approximately three quarters of its surface, are providing only about one percent of man's total food supplies and about 10 percent of his total animal protein supplies," the article says that production from these areas is limited not by the number of fish to be caught "but merely by limits on man's present ability to find, catch, and distribute."

The article stresses that "many existing fisheries resources are not being exploited to an extent anywhere near their safe productivity." "This," it continues, "is particularly the case in inland fish culture under controlled methods. For the Indo-Pacific region alone, the area of cultivable water is estimated at 37 million hectares (143,000 square miles), which could give very considerable results."

Drawing attention to some of the "less commonly exploited food resources," the article cites such examples as "zooplanktons which are taken in considerable quantities in Asian countries for the manufacture of pastes and other fisheries products; or seaweeds which, suitably processed, can yield large quantities of foods rich in carbohydrates." "It has been estimated, for instance," the article adds, "that Scotland alone could produce from 70,000 to 110,000 metric tons of carbohydrate annually, for human or stock consumption, from seaweeds harvested along the coastline."

Much of the work of the conference was concerned with different aspects of FAO's extensive and varied activities on the problem. Also before it were a number of background papers submitted by scientific and economic experts from many countries. These papers served as a basis for discussion, and included two by Dr. Michael Graham, Director of Fishery Research of the United Kingdom's Ministry of Agriculture and Fisheries.

Dr. Graham makes it clear that the problem is by no means a new one. Recalling some of the early history of fishery conservation efforts, he notes that in the year 1376 the Commons petitioned the King of England, complaining that "certain fishermen for seven years past have subtily contrived an instrument which they called 'wondyrchoun'." The "wondyrchoun," the petition said, was made like an oyster dredge with a close net attached. Its "great and long iron . . . runs so heavily and hardly over the ground when fishing that it destroys the flowers of the land below water there, and also the spat of oysters, mussels, and other fish upon which the great fish are accustomed to be fed and nourished. By which instrument in many places the fishermen take such quantity of small fish that they do not know what to do with them; and that they feed and fat their pigs with them, to the great damage of the Commons of the Realm and destruction of the fisheries. . ."

International Law Commission

TERRITORIAL WATERS AND FISHERIES ITEMS GET FIRST CONSIDERATION AT COMMISSION MEETING IN GENEVA: The International Law Commission is expected to concentrate its efforts on the items regime of the high seas and regime of the territorial sea at its seventh session which began at the Palais des Nations in Geneva on Monday, May 2. The session was scheduled to last for about 10 weeks, according to an April 27 U. N. news release.

The Commission was established by the General Assembly in 1947 to promote the progressive development of international law and its codification. Its members,

who, serve in their individual capacity as persons of recognized competence in international law and not as representatives of governments, are elected by the General Assembly.

The provisional agenda of the seventh session (Doc. A/CN. 4/89) contains eight items. Listed below, with background notes are those items of interest to the fisheries and allied industries.

Regime of the High Seas: The Commission decided to take up this question in 1949 when Professor J. P. A. Francois, who is also Secretary-General of the Permanent Court of Arbitration at The Hague, was elected special rapporteur for this matter. He has submitted six reports on the subject (Documents A/CN.4/17, A/CN. 4/42, A/CN.4/51, A/CN.4/60, A/CN.4/69 and A/CN.4/79). On the basis of some of these the Commission has adopted draft articles on the continental shelf, fisheries, and the contiguous zone (see document A/2456, chapter III). The sixth report of the special rapporteur (Doc. A/CN.4/79), which will form the basis of discussion of this item at the present session, deals with such subjects as the freedom of the high seas, merchant ships on the high seas, state ships on the high seas, safety of shipping, submarine cables and pipelines, penal jurisdiction in matters of collision on the high seas, policing of the high seas, sedentary fisheries, and water pollution. It is also probable that the Commission will again discuss the question of fisheries, as in the course of its session it will receive the report of the International Technical Conference on the Conservation of the Living Resources of the Sea which began at the Food and Agriculture Organization's Rome headquarters on April 18.

Regime of the Territorial Sea: In 1951 the Commission appointed Mr. Francois rapporteur for this subject. On the basis of his three reports (Doc. A/CN.4/53 A/CN.4/61 and A/CN.4/77) the Commission at its sixth session in 1954 prepared a draft which was circulated to the members of the United Nations for comments. A number of governments have submitted their observations (Doc. A/CN.4/90 and Addenda) and in the light of these observations the draft will be considered again by the Commission at the seventh session. The question of the breadth of the territorial sea was left open in the draft and the governments were asked to assist the Commission by stating their views on this problem. Several governments have done so, and it is expected that the Commission will endeavor to formulate concrete proposals concerning this controversial question at the present session. A working paper containing an analysis of the replies from governments will be submitted in the course of the session.

Members of the International Law Commission are elected for three-year terms by the General Assembly. The present membership is as follows: Gilberto Amado, Brazil; Douglas L. Edmonds, United States; J. P. A. Francois, Netherlands; J. V. Garcia-Amador, Cuba; Shuhsi Hsu, China; Faris Bey el-Khouri, Syria; S. B. Krylov, USSR; Radhabinod Pal, India; Carlos Salamanca, Bolivia; A. E. F. Sandstrom, Sweden; Georges Scelle, France; Jean Spiropoulos, Greece; Jaroslav Zourek, Czechoslovakia.

WHALING

ANTARCTIC CATCH DOWN IN 1954/55: The 1954/55 Antarctic pelagic (open sea) baleen whaling season, which ended on March 19, 1955, resulted in a provisional catch of 15,300 blue-whale units,[1/] or somewhat less than the 15,456 units taken during the 1953/54 season, according to preliminary information available in the April 11 Foreign Crops and Markets, a Department of Agriculture publication. The reported catch during the 72-day hunting period was well under the maximum catch quota of 15,500 units established by international agreement but, being provisional, may be incomplete.

1/ 1 blue-whale unit = 1 blue whale, or 2 fin whales, or 2.5 humpback whales, or 6 sei whales. Thus, the actual number of whales taken during the season is far greater than the indicated number of units.

Nineteen factoryships and about 230 catcher boats were engaged in the 1954/55 pelagic operations. Participating countries and the number of factoryships employed by each were: Norway 9, United Kingdom 3, Japan 3, and the Soviet Union, Netherlands, Union of South Africa, and Panama 1 each.

Complete data regarding the production of whale oil from this season's catch are not yet available. However, it is believed that output by Norwegian and British South African expeditions was down from the year before. Total production of whale oil during the 1953/54 Antarctic season was around 367,000 short tons. Some 25,000 tons of sperm whale oil also was produced during last year's pelagic operations.

Norway: According to reports from the 9 Norwegian expeditions total production by Norwegian factoryships was 665,794 barrels (about 111,000 metric tons) of whale oil, compared with 931,694 barrels (about 155,300 tons) in 1954; and 136,777 barrels (22,800 tons) of sperm oil in 1955 as compared with 31,391 barrels (5,200 tons) in 1954. This total production was the poorest for the Norwegians since the first postwar season in 1946/47, points out a March 25 U. S. Embassy dispatch from Oslo.

The value of the 1955 Norwegian whale oil, all of which was sold on forward contracts at prices ranging from £75-77.5 (US$210-217) per metric ton, has been estimated at 170 kroner (US$23.8 million) as compared with 211 million kroner (US$29.6 million) for last year's production. As this year's sperm-oil production has not yet been sold, its value has not been estimated.

Norwegian spokesmen have cited the following explanations for the reduced output by the Norwegian expeditions in the season just concluded: (1) with two additional non-Norwegian (one Japanese and one Onassis) expeditions in operation this year competition for the same number of blue-whale units (15,500) increased; (2) many of the whales caught by Norwegian expeditions this year were unusually lean and provided proportionately less whale oil; and (3) unfavorable weather at times hindered Norwegian whaling.

Japan: The three Japanese fleets reported a total catch of 2,771.6 blue-whale units, against a target of 2,150. This compares very favorably with an actual catch of 1,896 blue-whale units for the previous season, when only two fleets operated. Baleen whale oil obtained totaled 53,555 metric tons as compared to 37,540 tons for the 1954 expeditions, a March 25 U. S. Embassy dispatch from Tokyo reports.

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ANTARCTIC 1954/55 WHALE- AND SPERM-OIL PRODUCTION: Total production of whale and sperm oil during the 1954/55 Antarctic season was about 362,690 and 52,830 short tons, respectively, according to preliminary data reported by the U. S. Embassy at Oslo, Norway. This represents a decrease of nearly 10 percent in whale-oil production when compared with the final 1953/54 figure of 399,665 tons. Sperm-oil production, however, was almost double the 26,990 tons produced in the previous season.

Pelagic production by the 19 expeditions operating in 1954/55 accounted for 329,720 tons of the whale oil produced and 52,070 tons of the sperm oil. The remainder resulted from South Georgia shore-station operations.

INTERNATIONAL FAIR OF FISHERY AND ALLIED ACTIVITIES TO BE HELD IN ITALY

The Fifteenth "International Fair of Fishery and Allied Activities" will be held in Ancona, Italy, from July 16-31, 1955. The Fair will include an international marketing display of technical developments in commercial fisheries; technical congresses; meetings of fishermen; and events on sport fishing. Further information may be obtained from: Segreteria Generale della Fiera Internazionale della Pesca, Mandracchio, Ancona, Italy.

Aden

STATUS OF FISHERIES: Aden's fishing industry is loosely organized and its methods are primitive, reports a U. S. Embassy dispatch (April 1) from Aden. The fish caught are principally tuna, kingfish, caranx, sardines, and anchovies. What is not consumed is dried and salted for export, the latter running from 2,000-3,000 metric tons a year. The leading markets are still Ceylon, West Germany, and East Africa. A marketing officer was added to the Colony government in March and a proposed marketing and purchasing fishery cooperative may be developed. Also, there is some local business interest in organizing the industry to improve exports. Recently a United States ship left with a full cargo of dried fish for the United States.

Australia

VIEWS ON TERRITORIAL WATERS AND CONTINENTAL SHELF: Following the finding of Japanese fishing buoys at various places on Australia's eastern coast, some newspaper reports (Australian) and comments failed to distinguish between international law on two very different matters, namely, the sedentary fisheries and sea-bed resources of the continental shelf and the swimming fisheries outside territorial waters, points out the March 1955 Fisheries Newsletter, an Australian fishery publication. The Australian Minister for Commerce and Agriculture issued several press statements in the course of which he said:

"There appears to be considerable misunderstanding about the Commonwealth Fisheries Act 1952-53 which has been confused with the pearl fishing legislation passed by Parliment also in 1952.

"The Australian Government has shown in its pearl fishing legislation and in its administration of it, a complete determination to exercise its rights to control sedentary fishing on the Continental Shelf. Under international law these rights include the control of the products of the sea bed which of course include pearl oysters.

"The Government, on the other hand, has never sought to exercise control, other than of Australian nationals, in respect of the swimming fish industry. In its present state, international law draws a distinction between the resources of the sea bed and the control of swimming fish beyond the accepted territorial limits which, roughly speaking, are three miles off shore. The Fisheries Act lays down the rules with which Australians must comply in Australian waters outside territorial waters.

"The Commonwealth Government certainly wishes to negotiate agreements to regulate fishing in waters adjacent to Australia. However, it would be futile to expect the Japanese to limit their fishing operations on the high seas if we were not

prepared and in a position to control Australian fishing operations also, so that a total plan of conservation could be operated. We could put no limit on our own fishing operations without first passing a law to enable control of them, and that is one of the reasons why we passed the Fisheries Act in 1952. Australia now has a basis upon which to negotiate."

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TUNA LANDINGS, 1954/55: A large Sydney, Australia, tuna canner reports that tuna landings this season to December 31, 1954, totaled 1.5 million pounds, according to the February Fisheries Newsletter, an Australian fishery periodical.

British Honduras

FISHERY PRODUCTS EXPORTS, JANUARY-NOVEMBER 1954: British Honduras exports of fishery products in January-November 1954 totaled 296,000 pounds, valued at BH$125,000 (US$87,600), compared with exports for the similar period in 1953 totaling 224,000 pounds, valued at BH$84,000 (US$58,600). The United States received 64 percent of the British Honduras fish and shellfish exports in the first 11 months of 1954 as compared with 79 percent in the same period a year earlier (see table). Spiny lobsters comprised the bulk of these exports, and a large increase in shipments of whole spiny lobsters in 1954 accounted for the increase in total fishery products exports from British Honduras.

British Honduras Exports of Fishery Products, January-November 1954 and 1953 (Total Exports and Exports to United States)

Product	1954			1953		
	Quantity	Value		Quantity	Value	
	1,000 Lbs.	1,000 BH$	1,000 US$	1,000 Lbs.	1,000 BH$	1,000 US$
Fresh, frozen, or live fish:						
Total exports	63.0	16.9	11.9	59.2	15.3	10.7
Exports to U. S.	51.6	14.8	10.4	51.4	13.5	9.4
Salted, dried fish, etc.:						
Total exports	63.9	15.4	10.8	28.7	5.2	3.6
Exports to U. S.	-	-	-	-	-	-
Spiny lobsters, whole:						
Total exports	80.0	25.2	17.7	11.5	2.4	1.6
Exports to U. S.	51.7	19.5	13.6	3.7	.7	.5
Spiny lobster tails:						
Total exports	82.5	65.2	45.6	118.1	60.1	42.0
Exports to U. S.	81.1	64.1	44.9	117.1	59.5	41.6
Conchs:						
Total exports	3.1	.4	.3	6.9	1.0	.7
Exports to U. S.	1.5	.3	.2	5.0	.9	.6
Shrimp:						
Total exports	3.5	1.9	1.3	-	-	-
Exports to U. S.	3.5	1.9	1.3	-	-	-
Total all fishery products:						
Total exports	296.0	125.0	87.6	224.4	84.0	58.6
Exports to U. S.	189.4	100.6	70.4	177.2	74.6	52.1

British Guiana

FISHING INDUSTRY, 1953: Almost 6 million pounds of fish with an estimated value of US$1.4 million, were caught in 1953 in the waters of the seacoast and of the estuaries of British Guiana's major rivers, a U. S. consular dispatch (April 12) from Port of Spain reports. Although some deep-sea fishing is done off of British Guiana, most of the Colony's fish is caught in the relatively shallow, muddy waters along its 300-mile coastline.

Fishing activities include shrimping. A dried-shrimp and shrimp-meal factory is in operation.

During 1954 the British Guiana Credit Corporation made loans totaling about US$28,000 for development of the fishing industry.

Cuba

TUNA CAUGHT BY EXPLORATORY VESSEL FISHING IN CUBAN WATERS: A total of 5,100 pounds of tuna was caught by the Cuban vessel Cubamar II

Fig. 1 - Bait in the live-bait tank of the Cubamar II

Fig. 2 - A boat leaving the Cubamar II to load up with bait.

during a 5-day exploratory fishing cruise which began July 25, 1954. Only 3 hours and 10 minutes were required to catch the amount of tuna indicated. The average weight of the fish was 3 pounds each, and the catch consisted of 60 percent oceanic bonito or skipjack tuna (Katsuwonus pelamis) and 40 percent albacore (Germo alalunga).

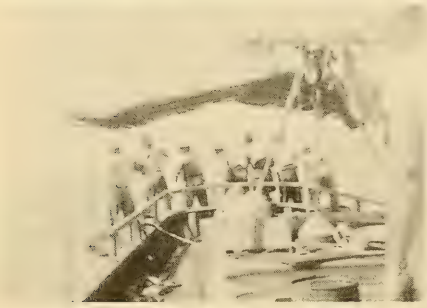

Fig. 3 - Pole-and-line fishing for tuna from Cubamar II.

A crew of eight fishermen used "manjua" (Jenkinsia lamprotaenia) as live bait and poles and lines for catching the tuna. The vessel fished 3 to 15 miles offshore, from Santa Cruz del Norte to Justias, between 82-84 W. longitude. The best fishing seemed to be encountered nearest to the approximate location of the Gulf Stream.

Fig. 4 - Part of the catch of tuna made by the Cuban exploratory fishing vessel during a 5-day cruise.

Fig. 5 - Crew having lunch aboard the exploratory fishing vessel Cubamar II.

Weather conditions during the cruise were clear, the sea was smooth, and there was a light breeze NE. to SE. Fishing conditions were good. The vessel was equipped with Japanese-type bait wells.

--Jose A. Ojeda, Master and Fishing Gear Technologist, Asociacion de Credito Pesquero, 'Felipe Poey,' Afilado al Banco de Fomento Agricola e Industrial de Cuba, Havana, Cuba

Costa Rica

VIEWS ON 200-MILE TERRITORIAL WATERS ZONE: The Costa Rican Foreign Minister in a press conference April 16, during a brief visit to Quito, Ecuador (El Comercio, April 17), discussed the declaration of Santiago in which Ecuador, Peru, and Chile claimed jurisdiction over a 200-mile maritime zone, an April 20 U. S. Embassy dispatch from Quito states. A summary of his comments follows:

"Nations should protect their fisheries resources which are the product of territorial wealth. This problem affects not only the three nations mentioned but the entire continent, and Costa Rica's attitude on this question has already been made clear. Costa Rica therefore has deemed it convenient to propose:

"1. That all the nations of America adhere to the Santiago Charter;

"2. To include this document in the problem of defense in the face of a possible extra-continental interference;

"3. To deposit this international document in the Pan American Union, open to the adherence of the other nations, and;

"4. To create an international policy, which at the same time that it guarantees free commercial navigation would protect the sovereignty of nations against illegal fishing and pirates."

Denmark

EXPORTS OF FISHERY PRODUCTS FOR HUMAN CONSUMPTION TO UNITED STATES, 1954: The value of Danish exports of fishery products for human consumption to the United States in 1954 was 12.6 million kroner (US$1.8 million) as compared with 13.0 million kroner (US$1.9 million) in 1953, reports the April 4 Foreign Commerce Weekly, a Department of Commerce publication. The principal item was fresh frozen brook trout, valued at 5.8 million kroner (US$0.8 million) in 1954 and 5.4 million kroner (US$0.8 million) in 1953. Cod exports were valued at 1.6 million kroner (US$0.2 million) in 1954--none in 1953. Frozen cod fillets exports rose from 0.4 million kroner (US$58,000) in 1953 to 1.0 million kroner (US$145,000) in 1954 because of the demand from United States fish-stick processors; flounder fillet exports increased from 0.8 million kroner (US$115,000) to 1.0 million kroner (US$145,000).

Danish canned lobster exports to the United States increased notably, from 0.3 million kroner (US$43,000) in 1953 to 1.0 million kroner (US$145,000) in 1954 while other canned fish, including brisling sardines, rose from 2.5 million kroner (US$360,000) to 2.8 million kroner (US$400,000).

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FISHERY PRODUCTS EXPORTS, 1954: Denmark exported fishery products worth about 225 million kroner (US$33 million) in 1954 against shipments worth about 203 million kroner (US$29 million) in 1953. Exports of fish meal were valued at 26 million kroner (US$3.8 million) against only 14 million kroner (US$2.0 million) in 1953. Fish-oil exports were worth 11 million kroner (US$1.6 million) against 9.5 million kroner (US$1.4 million) in 1953. These increases were due to higher prices caused by good demand, as the actual volume of exports declined 0.5 percent to 129,000 metric tons.

Great Britain was the largest buyer of Danish fishery products in 1954, purchasing 49 million kroner (US$7.1 million) worth. West Germany took fishery products valued at 25 million kroner (US$3.6 million) and Italy 23 million kroner (US$3.3 million).

The United States ranked fourth, receiving Danish fishery products and by-products valued at 22.3 million kroner (US$3.2 million). Other major markets for Danish fishery products were Sweden 21 million kroner (US$3.0 million), the Netherlands 14 million kroner (US$2.0 million), and Brazil 11 million kroner (US$1.6 million). Australia also appeared as a new outlet for Danish exports; shipments to that country in 1954 totaled 2.5 million kroner (US$360,000), and it was hoped that this would be considerably increased in 1954, reports the February 11 issue of The Fishing News, a British fishery magazine.

Formosa (Taiwan)

FISHERIES PRODUCTION AND TRENDS, 1954: Formosan fisheries production in 1954 amounted to 152,500 metric tons, 17 percent more than the 130,600 tons produced in 1953 and 82 percent greater than the 1950 production of 84,000 tons (see table), according to a report from the Assistant Director for Industry, FOA Mission to China. The coastal fisheries supplied more than one-half the total production each year, and the next in importance was the production from fish culture in fresh- and salt-water ponds.

All Formosan coastal fisheries and fish-culture stations are in private hands. Two Government fishing enterprises operate in the deep-sea fisheries, the remainder are privately controlled. The number of private operators in the deep-sea fisheries is unknown but it is considered to be large.

Pulling in the "bag" of a beach-seine net which holds the catch. This is a popular style of fishing in small communities of Taiwan. Men and women, old and young, join hands to pull in the net.

The total Formosan fisheries catch increased sharply in May and June 1954 due to good weather during the normal peak season; also, large schools of bonito, anchovy, horse mackerel, and flying fish came near the coasts, especially near the Pescadores Islands. An increase in the number of inshore fishing vessels operating, and an increased catch from fish ponds due to dry weather in southern Taiwain also contributed to the good catch in May and June.

The deep-sea catch increased sharply in April 1954 due primarily to the greater number of trips and vessels in operation. The typhoon season in July and August decreased deep-sea fishing. After September the deep-sea catch increased again due to more vessels and more trips and a higher catch per vessel owing to good weather.

The coastal fisheries catch decreased after September due to bad weather in northern Taiwan.

Production from fish ponds after May remained high because of a good market and the peak in the milkfish production season.

Deep-sea fishing includes fishing on the high seas by otter trawlers or bull trawlers of at least 50 tons on voyages which last an average of 10 days.

Formosan Fisheries Production, 1954 with Comparisons

Fisheries	1954	1953	1952	1951	1950
	(1,000 Metric Tons)				
Deep-sea fisheries:					
Government vessels	14.5	14.6	10.9	10.4	6.1
Private vessels	12.5	9.6	6.1	5.6	5.9
Coastal fisheries	83.9	67.8	74.0	63.0	47.0
Fish culture	41.6	38.6	31.0	25.0	25.0
Total	152.5	130.6	122.0	104.0	84.0

Coastal fishing includes fishing on small motor trawlers usually at sea for an average of 24 hours and a maximum of 3 days, and nonpowered boats such as sampans and bamboo rafts which operate near the coast.

As of December 31, 1954, there were 2,448 fishing vessels with a total tonnage of 36,558 gross tons (72,654 hp.) as compared with 2,084 vessels with a total tonnage of 29,434 gross tons (56,722 hp.) as of December 31, 1953.

Taiwan Fisheries Bureau of the Provincial Department of Agriculture and Forestry set a 1955 production goal for fisheries of 160,000 metric tons, since about 20 new 80-100 gross-ton bull trawlers will participate in deep-sea fishing, and about 250-300 new small vessels totaling 2,500 gross tons and a number of motorized sampans and bamboo rafts will join the coastal fishing fleet. Further, Tilapia culture in rice paddies will be increased with the encouragement of the Provincial Department of Agriculture and Forestry.

It was reported that Formosa and Japan would soon conclude an agreement for joint tuna fishing experiments, an April 28 U.S. Embassy dispatch from Taipei reports. Selected Chinese fishermen will accompany Japanese fishermen to the South China Seas, Indian Ocean, and other areas in the Pacific. The two nations are also discussing plans for joint mackerel fishing in Formosan waters.

U. S.-built trawlers in port of Keelung.

The Formosan Government has decided to expand the fisheries as a means of increasing food supplies and improving the diet. The Economic Stabilization Board concluded that the industry, particularly tuna fishing, has to be expanded from its present area of operations of 40,000 square miles to 3,000,000 square miles. The Board decided to recommend approval of a plan to construct four 350-ton fishing vessels in Japan at an over-all cost of NT$8.6 million (US$0.8 million). It was estimated that a balanced diet would include 211,000 metric tons of fishery products. The 1956 catch, it is estimated, will be only 170,000 tons.

The Formosan imports of fishery products in 1954 were valued at US$4.6 million, all of which was financed by the Formosan Government.

French Morocco

FISHERY PRODUCTS EXPORTS, AND BYPRODUCTS EXPORTS, 1954 and 1955: Exports of canned fish declined in value from 8.4 billion francs (US$24 million) in 1954 because of an unsatisfactory fishing season, reports an April 5 U.S. consular dispatch from Casablanca. The export value of fish meal and bone meal in 1954 also dropped below 1953.

Value of French Morocco's Fishery Products and Byproducts Exports, 1954 and 1953

Product	1954	1953	1954	1953
	Millions of Francs		Millions of US$	
Fish:				
Canned	6,215	8,402	18	24
Fresh, dried, salted and smoked	610	582	2	2
Fish meal and bone meal	381	707	1	2

French West Africa

FISHERY TRENDS: There appear to be great potentialities for fishing off the coast of French West Africa from Mauritania to French Guinea as well as in the Niger River, states a February 2 U.S. consular dispatch from Dakar. Commercialization of ocean fishing started during World War II. The ten-year development plan has as one of its objectives to increase the tonnage of fish taken. Although production has been estimated at about 4,000 to 5,000 metric tons per year, the potential is estimated at approximately 30,000 tons. In this connection, there now exists a huge freezing plant in Dakar which is being used in part for freezing tuna taken off the coast.

German Federal Republic

NEW FISH-MEAL DRYING PROCESS DEVELOPED: A Bremerhaven, West Germany, firm (Schlotterhose & Co.) has recently developed and constructed an entirely new fish-meal drying process. It is called the Circulation High-Speed Drier, reports International Fish and Other Food Journal (No. 1 - 1955), a Danish trade magazine.

The idea on which the process is based and for which patent applications have been filed is as follows:

The material to be dried is fed--raw or cooked--into a modern blowing mill, which is patented. This takes place in an atmosphere of hot circulating drying gas principally consisting of vapor, and during the process the material is minced and dried possibly under fermentation by the influence of heat, whereafter it is immediately cooled down.

It is consequently a rapid-drying process which increases the capacity of the individual devices. By admitting greater quantities of heat and accelerating the circulating gas flow, the capacity may be increased considerably.

The fish meal leaving the plant ready for storage is in no respect inferior in quality as compared with fish meal produced in the ordinary steam-jacket plants; on the contrary it possesses various advantages.

When producing lean fish meal or if fish is being dried without extraction of oil, a boiler will not be required for the new plant.

The same is the case when working with fatty offal if the fish is allowed to ferment prior to the drying process by means of the exhaust gases principally consisting of vapor, and if sufficient heat is present, whereafter stickwater and oil is extracted by squeezing.

For thermo-technical reasons the stickwater is concentrated in a vacuum-stage vaporizer, whereafter the concentrate together with the squeezed fish is fed into the Schlotterhose Circulation Drier and is dried in this device. Consequently all devices for further drying the stickwater concentrate, for instance roll driers, etc., conveyors and grinders are superfluous.

Surprising is the high thermo-technical efficiency of the process. By using fuel oil, a twelvefold evaporation figure may be obtained in a medium-sized plant. Consequently the fuel costs are far lower as compared with those of the steam-jacket plant and amount only to about one-third of the usual costs. The same thing applies to the drying of stickwater concentrate.

The initial expenditure and the space required for the new plant are extremely moderate. Also plants with greater capacities may therefore be installed in fishing vessels, where a minimum of space is available.

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PROCESSED FISHERY PRODUCTS PRODUCTION, 1954: The production of processed fish and shellfish products in West Germany during 1954 totaled 175,788 metric tons, and manufacture of fishery byproducts amounted to 97,058 tons of fish meal and oil (see table). Marinated fish and canned fish were the leading fishery products processed for food, reports an April 5 U. S. Embassy dispatch from Bonn.

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CANNED FISH IMPORTS AND EXPORTS, JANUARY-JUNE 1954: Total West German imports of canned fish

West German Production of Processed Fish, 1954

Product	Quantity
	Metric Tons
Smoked fish	30,588
Salted fish	29,932
Marinated fish	60,145
Canned fish	48,526
Shellfish	659
Miscellaneous fish products	5,938
Total fishery products	175,788
Fish oil	19,725
Fish meal	77,333
Total byproducts	97,058

in the first six months of 1954 amounted to 6,905 metric tons, according to an October 18 U.S. consular dispatch from Bremen (table 1). In 1953 canned fish imports totaled 14,793 tons, and in 1952 the total was 9,523 tons. Sardines and pilchards comprise the bulk of West German imports; Portugal and French Morocco were the principal suppliers.

Exports of canned fish from West Germany in January-June 1954 totaled 2,648 metric tons (table 2). In the 12 months of 1953 West German canned fish exports totaled 3,999 tons while in 1952 the total was 1,691 tons. The principal canned fish export item was herring which comprised approximately one-half of the total. Miscellaneous canned fish (coalfish or pollock, anchovies, sprats, etc.) and sardines and pilchard were the other items. West German canned fish is shipped to countries in all parts of the world.

Canned Mackerel: West German foreign trade in canned mackerel with the United States was practically nonexistent until March 1954. It was reported, however, that as a result of a drop in the pilchard catch in the United States, a sudden demand developed

Table 1 - West German Imports of Canned Fish, January-June 1954 with Comparisons

Item & Country	Jan.-June 1954			Year 1953			Year 1952		
	Quantity	Value		Quantity	Value		Quantity	Value	
	Metric Tons	DM1,000	US$1,000	Metric Tons	DM1,000	US$1,000	Metric Tons	DM1,000	US$1,000
Sardines and Pilchards:									
Yugoslavia	634.3	1,048	249	330.0	594	141	72.2	155	37
Portugal	4,070.7	8,696	2,069	8,109.4	17,135	4,078	7,091.2	16,307	3,881
French Morocco	1,789.8	2,684	639	5,634.5	9,541	2,271	1,735.9	4,058	966
Other Countries	7.2	23	5	9.3	30	7	64.6	81	19
Total sardines and pilchards	6,502.0	12,451	2,962	14,084.0	27,300	6,497	8,963.9	20,601	4,903
Herring:									
Norway	46.6	108	25	130.5	315	75	68.1	173	41
Sweden	12.1	36	9	35.6	107	25	36.3	108	26
United States	1.6	4	1	.4	1	1/	9.7	1	1/
Australia	-	-	-	-	-	-	34.0	56	13
Other Countries	-	-	-	1.5	4	1	7.3	17	4
Total herring	60.3	148	35	168.0	427	101	155.4	355	84
Miscellaneous	342.9	2/	2/	541.4	2/	2/	403.3	2/	2/
Grand Total	6,905.2	2/	2/	14,793.4	2/	2/	9,522.6	2/	2/

1/Less than US$500.
2/Not available.

for canned mackerel and similar products, particularly in the southern part of the United States. According to a reliable trade source, from March to October 1954 West Germany exported to the United States a total of about 27,000 cases (48 15-oz. cans) of mackerel. No information could be obtained as to the value of these exports.

Quoting the same informant, West German export companies have lately been encountering growing difficulties in the marketing of their products in the United States. It appears that the type of mackerel caught off European coasts is rather large. Packing into 15-ounce cans as required by the United States buyers is possible only by cutting the fish down to the required size, a practice which was not well received by customers. Further, mackerel caught by German deep-sea trawlers is landed only after a few days. Their quality does not compare favorably with Japanese and South African mackerel which is reportedly smaller and caught by inshore fishing boats landing their catches daily. As a consequence, it was reported, the stiffest competition in the U.S. market comes from these two countries, although the Netherlands and Denmark have also lately been rather successful in promoting their sales of canned mackerel in the United States, in spite of the same difficulties as encountered by West German exporters.

During the past few years West Germany has been importing rather large quantities of fresh mackerel. The bulk of these imports came from Denmark, smaller supplies from

Sweden. Exports of fresh mackerel were negligible; they did not exceed 30 tons per year. Fish traders estimate that about 70 percent of all imported fresh mackerel is re-exported canned. Besides exports of canned mackerel to the United States in 1954, West Germany has been exporting this commodity for several years to Mediterranean countries, but no exact figures on these exports are available.

Canned Sardines and Pilchards: The main emphasis of West Germany's foreign trade in sardines and pilchards is definitely on imports. During the past three years between 91 and 94 percent of all West German imports of canned fish consisted of sardines and pilchards, the bulk purchased from Portugal and French Morocco. Since about the start of 1953, Yugoslavia has been rapidly increasing its exports of this commodity to West Germany and in the first half of 1954 it supplied little less than 10 percent of all sardines as compared with only 2 to 3 percent in 1953. No transactions in this commodity with the United States have ever been recorded, according to the West German Bureau of Statistics.

Table 2 - West German Exports of Canned Fish, January-June 1954 with Comparisons

Item & Country	Jan.-June 1954			Year 1953			Year 1952		
	Quantity	Value		Quantity	Value		Quantity	Value	
	Metric Tons	DM1,000	US$1,000	Metric Tons	DM1,000	US$1,000	Metric Tons	DM1,000	US$1,000
Sardines and Pilchards:									
Belgian Congo	8.0	19	4	15.7	39	9	-	-	-
Austria	5.6	12	3	-	-	-	-	-	-
Other Countries	1.9	2	1	.5	2	1	4.6	13	3
Total sardines and pilchards	15.5	33	8	16.2	41	10	4.6	13	3
Herring:									
Belgium	27.9	59	14	54.6	122	29	53.1	125	30
Luxembourg	26.1	46	11	62.7	94	22	63.1	88	21
Saar Territory	38.8	73	17	96.0	176	42	83.3	153	36
Greece	55.7	63	15	113.8	109	26	-	-	-
Switzerland	66.8	104	25	179.8	314	75	195.0	350	83
United States	65.3	130	31	165.2	368	88	175.2	439	104
Great Britain	13.0	30	7	270.3	513	122	2.1	6	1
Austria	756.3	1,505	358	273.8	556	132	25.2	56	13
Egypt	12.5	16	4	290.8	323	77	.5	1	1/
New Guinea	31.8	35	8	276.7	314	75	-	-	-
Australia	90.4	161	38	23.5	25	6	-	-	-
Other Countries	356.5	603	144	359.5	601	143	361.7	726	174
Total herring	1,541.1	2,825	672	2,166.7	3,515	837	959.2	1,944	463
Miscellaneous	1,091.1	2/	2/	1,816.5	2/	2/	727.5	2/	2/
Grand Total	2,647.7	2/	2/	3,999.4	2/	2/	1,691.3	2/	2/

1/Less than US$500.
2/Not available.

Exports of sardines and pilchards fluctuated between .3 and .6 percent of total exports during the years 1952 through June 1954.

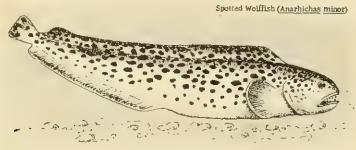
Canned Herring West German exports of canned herring outweigh imports by far. Since 1952 the exports of canned herring have represented between 54 and 58 percent of all canned fish exports, while imports have fluctuated between 1 and 1.6 percent. With the growing importance of other countries as buyers of West German canned herring, the percentage of U. S. purchases had dropped greatly in the past few years, as evidenced by table 3.

Table 3 - West German Exports of Canned Herring to the United States

Period	Volume	
	Metric Tons	% of Total
Jan.-June 1954	65.3	4
Jan.-Dec. 1953	165.2	8
" " 1952	175.2	18

Greenland

GOOD WINTER FISHING FOR WOLFFISH: Fishing for wolffish (ocean catfish) in Greenland waters was very good during the past winter, according to a report by a biologist in a Danish fishery periodical Vestjysk Fiskeritidende. He states that the young of wolffish have become more abundant in Greenland waters in recent years. It was hoped, therefore, that the good fishing would continue. At Sukkertoppen and Holsteinborg the fishery continues all year but farther north only a summer fishery can be conducted. At Sukkertoppen the abundance of wolffish has been greater than ever before so that line fishermen have been exceptionally busy. The catch is filleted and frozen for the United States market, reports Fiskets Gang (March 10, 1955), a Norwegian fishery magazine.



Japan

FISHERY AND MARINE PRODUCTS CATCH, 1954: Total production of fishery and marine products by Japan in 1954 amounted to 9.3 billion pounds (see table), according to estimates supplied by the Japanese Fisheries Agency to the U. S. Embassy at Tokyo (April). Fish products comprised the bulk of the catch--75 percent; followed by other marine products, 15 percent; and shellfish and seaweed products, each 5 percent.

Japanese Catch of Fishery and Marine Products, 1954

Products	Quantity
	Millions of Lbs.
Fish	6,943
Shellfish	432
Others	1,372
Seaweed	537
Total	9,284

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Japanese Estimated Canned Fish Production, 1954

Product	Case & Can Size	Quantity
		1,000 Cases
Crab	48 6½-oz. cans	470
Salmon	96 8-oz. cans	600
Tuna in brine	48 7-oz. cans	1,263
Tuna in oil	" " " "	300
Bonito in brine	" " " "	705
Bonito in oil	" " " "	120
Sardines in tomato sauce	48 15-oz. cans	500
Sardines, boiled	" " " "	300
Pike in tomato sauce	96 8-oz. cans	500
Pike, boiled	" " " "	300
Other	Various sizes of cans and cases	1,942
Total		7,000

CANNED FISH PRODUCTION, 1954: The total estimated Japanese canned fish pack in 1954 amounted to 7 million cases (see table), according to an April 1 U. S. Embassy dispatch from Tokyo. The major portion of the production consisted of tuna and tunalike fish--2,388 cases or 34 percent of the total. The remainder was made up of various species: Pike, sardines, salmon, crab, and miscellaneous items.

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OUTLOOK FOR 1955 FISHERIES PRODUCTION AND EXPORTS: Increased catches of salmon and crab are anticipated because it seems that Japanese vessels will now be able to fish closer to U. S. S. R. waters. The Antarctic whaling expeditions have closed their season with a catch of 2,771 blue-whale units as compared to 1,896 units in 1954. A production of about 53,000 metric tons

of whale oil will be available for export at a price in the vicinity of US$165 a ton without benefit of a sugar-link subsidy.

Unofficial estimates by various segments of the fishing industry on total exports of principal fish and fish products to all destinations in 1955 are shown in the table. These figures represent only guesses or hopes as to the amount of export movement.

Estimated Japanese Exports of Principal Fish and Fish Products, 1955

Products	Unit	Quantity
Tuna and bonito, frozen	Metric tons	59,000
Tuna and bonito, canned	Cases	1,800,000
Salmon, canned	Cases	800,000
Sardines, canned	Cases	500,000
Crab, canned	Cases	550,000

The figure for frozen tuna and bonito implies a 12-percent increase, and will depend largely upon the state of the United States market which is presently weak. The salmon exports will be contingent upon the renewal or extension of the Japanese-United Kingdom trade agreement, as canned salmon is sold chiefly to the sterling areas. The increased export hoped for in canned tuna and bonito also assumes about a 7-percent increase in the United States market, which is understood to have a large stock on hand. The United States figure may therefore not be reached. The crab export is planned on the basis of 300,000 cases to the United Kingdom and 200,000 to the United States. The former again is dependent upon trade relations with the United Kingdom; the latter is approximately the amount taken by the United States in 1953 but is substantially above the 1954 figure.

Considering all factors, Japan's exports of aquatic products, including both fish and other marine products, should be in the neighborhood of US$120 million for the calendar year 1955, or about a 20-percent increase over 1954, an April 1 U. S. Embassy dispatch from Tokyo reports.

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PEARL OYSTER CULTIVATION IN INLAND SEA SUCCESSFUL: Cultivation of pearls off the southern tip of Awaji Island, first attempted in 1951, has passed the experimental stage and is now said to be a commercially sound operation, a February 15 U. S. consular dispatch from Kobe reports. The Inland Sea has not heretofore been considered suitable for pearl culture and the Awaji grounds are the first within the Sea to be successfully developed. In 1954, 130,000 first-grade pearls from Awaji were displayed at the Pearl Center in Kobe.

Plans for 1955 call for sinking 200,000 mother oysters. This number will be increased annually until a goal of one million per year is reached.

Mexico

MERIDA FROZEN SHRIMP EXPORTS, OCTOBER-DECEMBER 1954: Frozen shrimp exports from the Merida District of Mexico (all to the United States) totaled about 1,925 metric tons in October-December 1954, almost 27 percent more than the 1,520 tons of the previous quarter, a March 1 U. S. consular dispatch from Merida reports.

Prices for 15-20 count frozen shrimp (heads off) delivered in Brownsville, Tex., each month April through December for the past four years were as follows:

Month	1954	1953	1952	1951
	(U. S. Cents Per Pound)			
Apr.	58	80	57	53
May	62	90	56	54
June	55	90	58	57
July	57	80	60	60
Aug.	58	75	62	58
Sept.	52	67	62	55
Oct.	49	66	62	50
Nov.	49	66	62	53
Dec.	52	68	65	53

Conditions during the last quarter of 1954 continued to improve on the basis that the catch was sold at a profit over operating costs. However, many outfits in Ciudad del Carmen, the center of the industry, are still in difficulties as the result of overexpansion based upon the abnormally high prices of 1953.

During the October-December 1954 period the export cost to Brownsville was reduced from 16 to 14 U. S. cents a pound. This reduction was made possible by decreased freight rates, operating costs, and export taxes. These lowered operating costs have gone far to offset the lower prices of the current year.

Merida frozen shrimp exports from Ciudad del Carmen and Campeche (all to the United States) in the 12 months of 1954 totaled 12.3 million pounds as compared with 9.7 million pounds in 1953 from Ciudad del Carmen only.

Netherlands

FISHING FLEET, 1955: The Netherlands fishing fleet on January 1, 1955, consisted of 2,509 vessels of 87,913 gross tons (see table), according to a U. S. consular dispatch of April 1.

Netherlands Fishing Fleet, January 1, 1955

Type of Vessel	No. of Vessels	Gross Registered Tons
Steam trawlers	18	6,688
Steam Luggers	20	3,800
Other steam vessels	2	124
Motor trawlers 500 hp. and over	11	3,118
Motor luggers and small trawlers	235	36,095
Motor cutters	348	12,943
Other motor vessels 7 tons and over	1,046	22,990
Motor vessels less than 7 tons	234	799
Sail vessels 7 tons and over	25	543
Sailboats and rowboats less than 7 tons	570	813
Total	2,509	87,913

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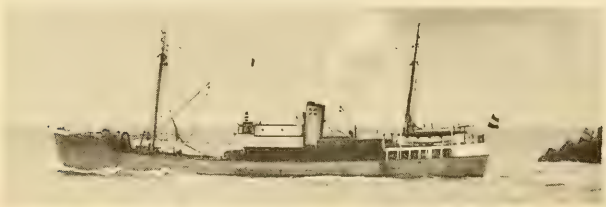
SCHOOL FOR FISHERMEN: In the Netherlands ever-growing attention is being paid to the training and education of fishermen. A fishing school recently opened by the Minister for Agriculture, Fisheries and Food offers a striking example.



Typical steam trawler used by fishermen of the Netherlands.

In his opening speech the Minister pointed to the growing need for a thorough training because constant technical development imposes higher demands on the

crews of fishing vessels. These demands are not confined to nautical knowledge but also hold good for the handling of fish and fishery products. It is essential that they should know their jobs thoroughly. The home and export markets demand fish of superior quality. In general it can be said that the fisheries are developing more and more into a rational industry, which must supply high-quality products at the lowest possible prices. All-around training is essential to reach efficiency.

The fishing port of Katwijk is proud of this school which supplies a long-felt need. A total of 385 young and adult fishermen are attending the various day and evening classes. The interest shown is so overwhelming that accommodations have already become inadequate, reports the February issue of Holland Fish Trade, a Netherlands fisheries magazine.

Norway

NEW HERRING PRESS: A new and revolutionary herring press, embodying a principle different from that used in the usual screw press, is being tested in a Haugensund, Norway, herring oil and meal plant, according to a report in Fiskaren (February 16), a Norwegian fishery periodical. The inventor of the press, Knut Ø. Dahl, an engineer with A/S Myrens verksted in Oslo, is seeking patents in Norway and other countries. The press will be ready for delivery in the 1955/56 herring season.

Oil and water are expressed by the press in a double action as the pressure increases and the press cake can be kept much thinner than in the present presses. The pressure in the press also can be adjusted according to the type of raw material while it is in full operation. The new press uses only one-half the power and one-third the space required by present presses and weighs only one-half as much. Operating costs and the price of the equipment also are reported to be appreciably less.

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FISH-FLOUR PLANT BEING BUILT: A plant is being built at Stamsund in North Norway by A/S Sea Foods to process fish waste into non-fattening, albumin-rich flour suitable for human consumption, based on a United States patent, reports an April 14 bulletin from the Norwegian Information Service.

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ARCTIC SEAL PRODUCTION, 1954: Norwegian sealing operations in 1954 resulted in a total catch of 259,194 animals from which about 5,760 short tons of blubber was obtained, according to the U. S. Embassy at Oslo. This is a 51-percent increase as compared with the 1953 output of 3,810 tons but under the 1952 and 1951 production of 6,560 and 9,300 tons, respectively.

Norwegian sealing expeditions operate in the spring and summer in five areas of the Arctic. Most of the sealing is conducted in international waters in the area of drift ice known as the Western Icefields located east of Greenland and north of Iceland.

In addition to sealing, Norwegian vessels engaged in Greenland shark fishing which yielded 226 tons of shark oil, or less than half the quantity produced in 1953.

Pakistan

FROZEN FISH EXEMPT FROM EXPORT TAX: Processed frozen fish is exempt from all Pakistan customs duties when exported effective March 4, 1955, according to a March 31 U. S. Embassy dispatch from Karachi.

The exemption is an example of the planning and efforts of certain officials of the Ministries of Finance, Commerce and Industries to utilize better the country's natural resources, and to build up foreign exchange receipts from hitherto untapped sources. Up to the present exports of fresh frozen processed fish have been insignificant, and without doubt they would have remained so if this tax of Rs. 5 per maund (1.8 U. S. cents per pound) had not been removed.

Fresh-frozen processed fish were included in the Export Tariff Schedule under the classification of "Fresh Fish," there being no distinction between fresh fish in the natural state and merely iced for export, and frozen and processed fish for export.

A fisheries firm in Pakistan in which there is a substantial share of United States private capital, found it could not compete in world markets if an export tax of Rs. 5 per maund (1.8 U. S. cents per pound) was assessed. One of the company's primary objectives was to export a large share of its catch after it had been processed and frozen.

Officials of the company visited officials in several Government of Pakistan ministries and explained the position and predicament of the firm. Emphasis was placed on the fact that there would be no income to the government if the tax were retained and the prospects for a new source for foreign exchange were nonexistent. If the tax were removed, however, there were good prospects that a substantial new exchange earner would be found, and that a modern fish-catching and processing industry would, in all probability, be built up over a period of years.

* * * * *

FOA TO FINANCE FISHERIES DEVELOPMENT PROJECT: A project agreement with Pakistan calling for an expenditure of US$88,000 for fisheries development in West Pakistan was reported April 19 by the U. S. Foreign Operations Administration. The funds will be used to purchase gear and equipment for two exploratory fishing vessels previously acquired, equipment for a survey of inland waterways, and equipment for refrigeration rooms and display cabinets to improve fish marketing methods.

Panama

FIRST FISH-MEAL AND OIL PLANT OPENED: Panama's first fish-meal and oil plant was formally inaugurated on February 18, 1955, reports the U. S. Embassy at Panama. The plant is located at Puerto Caimito in the District of Chorrera. The factory will produce and export fish meal for use as fertilizer, chicken and animal feed, and fish oils and fats for the preparation of oils, paints, varnishes, glycerine, and the manufacture of soap and candles.

The plant equipment, with its electric power generating unit, is of United States manufacture and was acquired at a total cost of US$250,000. It is installed in a floor area of about 16,000 square feet, and has a processing capacity of approximately 15 short tons of raw material per hour. Although the firm owns a small fishing fleet, the management has announced that the company will buy all quantities of fish offered for sale. When the plant is in full operating capacity (24 hours per day), it will require a total complement of 150 employees. In the packing of the finished products, the company plans to use locally-manufactured 100-pound jute bags with a special impermeable lining.

Peru

PERMISSION GRANTED TO THREE U. S. VESSELS TO FISH WITHIN 200-MILE TERRITORIAL WATERS ZONE: The Peruvian Government has given authorization to a Peruvian firm to allow three United States flag fishing vessels to operate within the Peruvian 200-mile territorial waters claimed by them. The Government newspaper La Nacion (March 10) claims: "Peru's 200-mile limit has again been confirmed and its basis on sound jurisprudence ratified," according to a March 12 U. S. Embassy dispatch from Lima.

The Peruvian newspaper continues: "Within this limit it is not permissible to fish, hunt whales, nor carry on any industry based on fish without obtaining previous permission--such as this corporation has done--under penalty of fine, requisitioning of the fish illegally taken, or capture of the ships," as happened in 1954 in the case of the Onassis fleet and, more recently, in the case of ships belonging to North American industry.

The authorization is contained in Ministerial Resolution No. 478 of March 9, 1955, and provides that the fish caught by these vessels will be considered nationalized (Peruvian) and there will be paid as an export tax US$8 per ton of fish.

The authorization is valid for one year and contains a number of other stringent provisions as follows:

The newspaper continued: "The full existence of the Peruvian thesis, confirmed and converted into actual law in the Lima Meeting of 1954 with Chile, Ecuador, and Peru, during the Second Conference on the Exploitation and Conservation of the Maritime Resources of the South Pacific, requires as a prerequisite the respect of the 200-mile limit as established by these three countries as their territorial waters.

"This limit nevertheless does not signify any obstacles for foreign ships passing through this zone and carrying on fishing. But national sovereignty and the future legitimate conservation of fish resources requires that the volume of this industry be known, especially when it is foreign. For this a permission is necessary just as happened in the case of the Corporacion del Pacifico Sur, S. A.; such permission was granted without the slightest difficulty after previous consultation with the Fishing and Hunting Section of the Ministry of Agriculture, the Peruvian Section of the Permanent Commission of the Conference for the Exploitation and Conservation of the Maritime Resources of the South Pacific, and the Port Captains Office, and after having considered the opinion of the Chief of Staff of the Navy.

". . .2. The boats referred to will have to arrive and leave from the port of Talara in order to comply with the maritime controls and fiscal regulations.

"3. The fishing that might have been done in the high seas, outside of the 200 miles, before entering the Peruvian jurisdiction, shall be duly controlled on arrival of the ships at Talara and taken into consideration in order to make deductions regarding the payment of the respective fees;

"4. The fish obtained through the above-mentioned vessels will be considered nationalized and there will be paid as an export tax eight dollars ($8, American money) per ton of fish.

"5. The company will embark in the above-mentioned ships, furnishing lodging and food, any person who is named by the Fishing and Hunting Section, the Ministry of Finance, the Administration of Port Captains, or the Office of Port Captains in order to undertake the technical and customs control of fishing while the boats are operating.

"6. The bait that is used for fishing shall be obtained by each ship itself and the sale or transfer to other boats is prohibited.

"7. Absolutely forbidden is fishing for anchovy, machete, and sardines for industrial purposes.

"8. Forbidden to these boats is the transfer of fish to any other boat of a foreign flag already on the high sea or in port, except when it is a matter of exportation of the product, in which case the transfer will be effected but only in port with the supervision of the maritime and customs authorities;

"9. At the port of destination the company should obtain a certificate from the Port Authority or Customs regarding the quantity of fish unloaded and should deliver it to the nearest Peruvian Consul in order that it may be transmitted to the Ministry of Finance.

"10. The present authorization involves the use of the port facilities, provisions, fuel, etc., that the above-mentioned boats would need during the time of the present authorization.

"11. The company remains obligated to comply with the other conditions expressed in the request of the Executive Director of the Corporacion del Pacifico Sur, S. A., dated January 17, 1955.

"12. All the activities of fishing by these boats shall be subject to the control of the Office of Fishing and Hunting which will indicate the limitations and the time when fishing is forbidden and dictate the technical activities that it deems most convenient for the purpose of the preservation of the fishing resources.

"13. The company as well as the owners of the ship assume full responsibility for the infractions that are commited of laws and national regulations and, as a guarantee, will deposit in the Office of the Port Captains at Talara the documentation of same (the ships), receiving in exchange a copy of the present Ministerial Resolution authorizing them to operate in Peruvian waters.

"14. Neither the company nor the owners of vessels will have the right to make any claims from the national or foreign authorities in case of non-compliance with the contract by either party.

"15. This authorization is valid for a period of one year from the date of the present resolution, and can be extended by previous notification to the permanent commission within a time of 30 days of expiration. . . ."

Spain

VIGO FISHERIES TRENDS, FEBRUARY 1955: Fishing: February is the poorest month of the year for the Vigo fishing industry, and the volume of catches entered through the port during the month declined, a March 15 U. S. consular dispatch from Vigo reports. Nonetheless, landings were slightly larger than in the same month of the preceding year. Smaller catches by the long-range fleet off Ireland and the beginning of the closed season for sardine fishing, as well as rough weather and the continued absence of part of the fleet operating from southern ports, all formed part of the normal February fishing picture.

Fish Canning: Canneries in the Vigo area purchased 131,000 pounds of fish during February 1955--1.8 percent of the total catches entered through the Vigo fish

exchange. This compares to 292,000 pounds or about 3.5 percent of the catch in the previous month, and 202,000 pounds or about 3.4 percent in February 1954.

The decline in the volume of fish purchased by the canneries in February was principally due to the scarcity of varieties suitable for canning. The bulk of the purchases consisted of "castaneta" (brama-raii) and small quantities of anchovies.

Spanish Morocco

FOREIGN TRADE IN FISHERY PRODUCTS, 1953 AND JANUARY-MARCH 1954: Spanish Morocco (not including Ceuta and Melilla) imports of fishery products in the first quarter of 1954 totaled 557 metric tons, valued at 1.0 million pesetas (US$23,700); and for the year 1953 amounted to 1,601 tons, valued at 3.6 million pesetas (US$83,500), reports an April 11, 1955, U.S. Legation dispatch from Tangiers.

Exports of fishery products from Spanish Morocco during January-March 1954 totaled 684 metric tons, valued at 9.7 million pesetas (US$223,000); and the total for the 12 months of 1953 amounted to 3,398 tons, valued at 37.3 million pesetas (US$860,000).

Trinidad and Tobago (British West Indies)

FISHERIES TRENDS, 1954: The fishing industry of Trinidad and Tobago suffers from supply fluctuations; fresh fish are generally more scarce and expensive during the dry season than in the rainy season. The seasonal variations in catch are illustrated by the delivery of 705,000 pounds of fish to Port of Spain, the Colony's principal market, in the first quarter of 1954 and 1,307,000 pounds in the third quarter.

Practically all the fish caught is consumed in Trinidad and Tobago. Only 60,000 pounds of locally-caught fish, fresh or lightly preserved, were exported in 1954.

The Government maintains a fish farm where experiments are carried out in the breeding of fresh-water fish, a March 25 U. S. consular dispatch from Port of Spain reports.

U.S.S.R.

FACTORYSHIP FISH CANNERY COMPLETED IN EAST GERMANY: The Pushkin, first of 24 factoryship fish canneries which a shipyard in Kiel, East Germany, is building for the Soviet Union, has been completed, according to the April 6 Journal of Commerce. In addition to the ordinary trial runs, the Pushkin will undertake a 13-week trip with a German crew to the Barent Sea. This extensive cruise is necessary because the fishing equipment as well as the cannery installations are mainly new constructions which have to undergo many tests. After the trial runs the Pushkin will be handled over to the Sudo Import Co., in Moscow.

The second of these vessels will be completed soon, and later on the floating canneries are to be delivered at the rate of one every three weeks.

Venezuela

FISH CANNERS FACING CRISIS: Competition among Venezuelan fish canners has forced low prices and added to the retailers profit; to remain solvent the canners

have been forced to lower the quality of their pack, an April 5 U. S. Embassy dispatch from Caracas states.

The Caracas press (El Universal, April 5, 1955) under the heading "Fish Canning Industry Needs a Complete Reorganization" tells the story:

"In consequence the quality is inferior to that of three years ago, for which reason it is difficult, if not impossible, for this product of Venezuela to capture a permanent international market.

"But before going to the Government the industry must be put on a sane basis, the market must be moralized, ruinous competitive pricing must be abandoned, and the quality of the product, today plenty deficient, must be improved."

The canners believe the first move is to stabilize the local market and end the ruinous competition. If this does not make fish canning profitable, then Government action should be requested. The canners suggest this action should be protection, but some protection already exists.

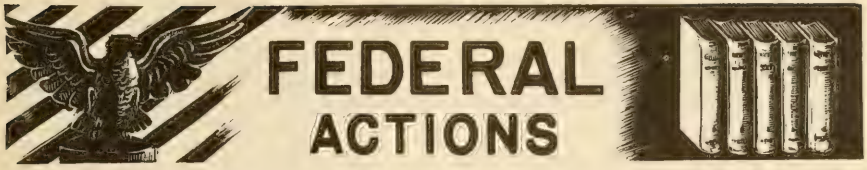
The high cost of canned fish is due to the cost of cans which represents 54 percent of the total costs, and oil 23 percent; and the fact that during the war the industry grew careless of costs. The canners believe that the Government should finance the next pack, thus enabling them to operate at better than 26 percent of capacity. They point out that if the Government will finance the pack there will be no need for the fish dollar.

A report indicated a representative of the Venezuelan Foreign Office had succeeded in interesting British buyers in Venezuelan canned sardines, according to El Nacional of March 15. This report stated that negotiations were in progress for the sale of 60,000 cases, and if this negotiation was satisfactory the same purchaser would buy 50,000 additional cases.

At the same time the representative informed the canners they must reduce their costs and prices. He stated that several canners were marginal producers and will fail unless they adopt adequate methods for reducing costs. "The situation today is characterized by large production, prices that do not cover costs, and strong competition in the national market," he said.

The solution as seen by that representative is in reducing costs by better organization, a March 15 U. S. Embassy dispatch from Caracas points out.

On April 13 the canners reported that the sale of Venezuelan canned sardines to Great Britain has fallen through because although fish quality was satisfactory the price was not, according to an April 22, U. S. Embassy dispatch from Caracas. The canners mourn the loss of a sale of 2,000 metric tons of fish and see no possibility of selling to Britain.



Department of the Interior

FISH AND WILDLIFE SERVICE

ALASKA ACTIVITIES REORGANIZED: A reorganization of the Alaska activities of the Fish and Wildlife Service was announced by Secretary of the Interior McKay on May 20. Under this reorganization, Alaska activities will be divided into two major fields: (1) Management of the commercial fisheries; and (2) administration of the wildlife and game-fish resources.

In commenting on this realignment which will separate commercial fishing activities from sport fishery and wildlife management, Secretary McKay said: "This organizational approach reflects the nature and importance of the commercial fisheries functions and the unique responsibilities of the Service in Alaska but it does not represent any departure from regional organization in the continental United States under which all functions are responsible to a single field director."

The salmon fisheries--the Territory's most important industry--suffered a sharp decline during the past 10 years in some parts of Alaska and a vigorous restoration program was inaugurated last year by Service Director Farley. To put this program into operation, a special commercial fisheries administrator was appointed and the fisheries were managed apart from the regional office organization, resulting in greatly improved management of the resource. The new reorganization will formalize on a somewhat amplified basis the operating situation that prevailed in 1954 and will provide more direct lines of authority in the continuation of this salmon program.

Research on the Alaska commercial fisheries, which at present is being handled by the Seattle laboratory under the direct supervision of the Washington office, will be included in the commercial fisheries organization so that all functions concerned with the management of the commercial fisheries of the Territory will be handled by a single field organization.

Both the commercial fisheries and the wildlife units will have their own enforcement staffs, but personnel, equipment, and facilities will be shifted between the two organizations as seasonal and program demands require. One central unit in the Juneau headquarters office will provide fiscal, personnel, and other administrative services to both organizations.

Donald L. McKernan has been named as Administrator of Alaska Commercial Fisheries. McKernan has been Assistant Director of the Service's Pacific Oceanic Fishery Investigations in Honolulu, Hawaii, for the past three years. Prior to that he served as Director of Research for the Oregon Fish Commission for six years. He also has had extensive experience in fishery research and administration with the Washington State Department of Fisheries where he directed research on the shellfish resources of the State.

In 1950, McKernan spent four months in Japan as a visiting fishery expert at the request of the Department of the Army. He is a graduate of the University of Washington and has completed more than two years of graduate work at that institution. He is the author of a number of publications on salmon and other Pacific Coast fisheries.

McKernan is expected to report to his new post in Juneau some time in June. In the meantime, Seton H. Thompson, Chief of the Service's Branch of Alaska Fisheries, at Washington, D. C., who is now in Alaska, will begin the implementation of the new set-up.

Clarence J. Rhode, presently Regional Director of the Service in Alaska, will head the wildlife management unit with the title of Administrator, Alaska Wildlife Resources. Rhode will continue as a member and Executive Officer of the Alaska Game Commission.

Rhode has been with the Service continuously since July 1935 except for a Three-year period from 1944-47 when he did wartime work as a civilian pilot. He was appointed Regional Director for Alaska in April 1948. In December 1952 he received the Department of the Interior's highest honor, a Distinguished Service Award.

* * * * *

DAY RETIRES FROM FISH AND WILDLIFE SERVICE:

Albert M. Day, Assistant to the Director of the Fish and Wildlife Service, will retire on June 30 after 36 years of Federal service, Acting Secretary of the Interior Davis announced May 27. Day, who was Director of the Service from 1946-1953, is joining the Arctic Institute of North America where he will direct a fact-finding study of migratory waterfowl.

Albert M. Day

First employed by the former Bureau of Biological Survey in 1919 as a temporary field assistant in Wyoming, Day has since been continuously connected with the Biological Survey and its successor agency, the Fish and Wildlife Service, except for a year's leave for graduate studies.

In December 1950, in addition to his duties as Director of the Fish and Wildlife Service, Day was appointed as Administrator of the Defense Fisheries Administration.

From 1947 to 1953, Day served as one of the United States Commissioners on the International Pacific Salmon Fisheries Commission. He is a member of practically every scientific organization in both the fisheries and wildlife field.

BUREAU OF LAND MANAGEMENT

OUTER CONTINENTAL SHELF LEASE SALE AT NEW ORLEANS:

A third sale of oil and gas leases in the Outer Continental Shelf of the Gulf of Mexico was scheduled for 10 a.m. (C.S.T.) July 12, 1955, in New Orleans, La., Secretary of the Interior McKay announced May 13.

The sale will embrace 674,000 acres of submerged lands off both Louisiana and Texas extending to waters as far as 60 miles from shore and 100 feet deep. The bulk of the lands advertised--458,000 acres--are off Louisiana. Most of the 595,000 acres of lands nominated by the oil and gas industry on March 25 are included in the advertised lands.

In two previous sales, 487,000 acres of oil and gas lands and 25,000 acres of sulphur lands leased on the Texas and Louisiana Outer Continental Shelf have brought the Federal Government $142 million.

Cadastral engineers of the Bureau of Land Management have mapped 12 million acres off Louisiana and 8 million acres off Texas as potentially leasable areas of the Outer Continental Shelf. Areas leased in the first two sales constitute less than three percent of the potentially leasable acreage on the Outter Continental Shelf off Texas and Louisiana.

Secretary McKay has described the opening of the Outer Continental Shelf for large-scale development as providing another strong link in this country's chain of national Petroleum security.

Eighty-Fourth Congress (First Session)

MAY 1955

Listed below are public bills and resolutions introduced and referred to committies or passed by the Eighty-Fourth Congress (First Session) and signed by the President that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions are shown in this section when introduced and, if passed, when signed by the President; but also shown from month to month are the more pertinent

reports, hearings, or chamber actions on some bills.

ALASKAN STATEHOOD: H. R. 6178 (Saylor), introduced May 11. A bill to enable the people of Alaska to form a constitution and State government and to be admitted into the Union on an equal footing with the Original States; to the Committee on Interior and Insular Affairs.

ALASKAN-HAWAIIAN STATEHOOD: On May 10 by a record vote of 218 yeas to 170 nays, the House recommited H. R. 2535, the Alaskan-Hawaiian statehood bill.

GREAT LAKES FISHERIES CONVENTION: The Senate Committee on Foreign Relations on May 17, in executive session, ordered favorably reported Convention on Great Lakes Fisheries between U. S. and Canada. Prior to this action, the subcommittee ordered this Convention favorably reported to the full committee.

HAWAIIAN STATEHOOD: H. R. 6177 (Saylor), introduced May 11. A bill to enable the people of Hawaii to form a constitution and State government and to be admitted into the Union on an equal footing with the Original States; to the Committee on Interior and Insular Affairs.

INTERIOR DEPARTMENT APPROPRIATIONS: The Senate Committee on Appropriations on May 2, in executive session, ordered favorably reported to the Senate with amendments H. R. 5085, appropriations for fiscal year 1956 for the Department of Interior and related agencies (including the Fish and Wildlife Service). As approved, the bill would provide total funds of $327,987,088, an increase of $30,061,542 over the House-passed figure of $297,925,546 (S. Rept. 261). Under "Investigation of Resources," which includes the Branches of Commercial Fisheries and Fisheries Biology, the Committee recommended an appropriation of $4,187,000.

The Senate passed on May 5, with committee amendments H. R. 5085. Senate insisted on its amendment and asked for a conference. Conferees were appointed. Some of the increases recommended by the Senate Committee over House-approved appropriations were: (1) $200,000 additional to provide a total of $350,000 for sea-lamprey research; (2) $5,000 to provide for operation at 100 percent capacity at the Frankfort Fish Cultural Station; (3) $20,000 for the propagation of fresh-water mussels.

The House Committee on Interior Department Appropriations on May 9 disagreed to Senate amendments to H. R. 5085, and agreed to a conference requested by the Senate; and appointed conferees.

MARKETING FACILITIES IMPROVEMENTS: H. R. 6220 (Sikes), introduced May 12. A bill to encourage the improvement and development of marketing facilities for handling perishable agricultural commodities; to the Committee on Agriculture.

MINUMUM WAGE INCREASE: H. R. 5968 (Metcalf), introduced May 3. A bill to amend the Fair Labor Standards Act of 1938 so as to increase the minimum wage from 75 cents to $1.25; to the Committee on Education and Labor.

Also H. R. 6505 (Fino), introduced May 26, similar to H. R. 5968.

NATURAL RESOURCES COMMISSION: S. 1924 (Carlson) introduced May 11. A bill to establish a commission on the conservation, development, and use of renewable natural resources; to the Committee on Interior and Insular Affairs.

Also H. R. 6163 (Hope), similar to S. 1924.

TRADE AGREEMENTS: The Senate on May 4 passed with amendments H. R. 1 to extend the authority of the President to enter into trade agreements, after taking actions on amendments submitted as follows:

Adopted: Morse amendment providing that evidence of serious injury or threat thereof to a readily determinable segment of a producing organization shall be considered evidence of such injury or threat to the domestic industry producing like or competitive products; and

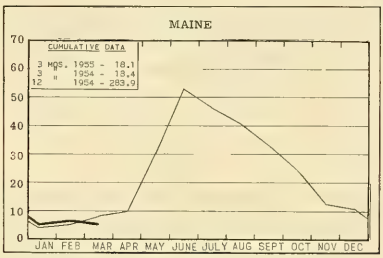
Rejected: Malone amendment (in the nature of a substitute for the bill) authorizing FTC to operate trade agreements program and to provide for periodic adjustment of import duties based on competition between U. S. and foreign-made products; Humphrey amendment to establish a trade adjustment board, the function of which would be avoidance or easing of economic losses to communities, industries, and individuals suffered through operation of trade agreements program; Douglas amendment to repeal peril point section of the bill; O'Mahoney amendment holding in abeyance any future trade agreement until Congress has specifically approved it; Morse amendment providing that no future trade agreement shall take effect until expiration of 90 days of continuous session of Congress following its transmittal to Congress, nor shall take effect if during such 90 days of session either House of Congress shall disapprove such trade agreement; Morse amendment providing that after Tariff Commission makes recommendation and President transmits to Congress his reasons for not taking action thereon, the Congress may within 90 days of continuous session thereafter pass a concurrent resolution favoring the Commission's recommendations and the President shall then put them into effect; Douglas amendment to eliminate sections 5 and 6 of the bill, providing for Trade Commission findings in Federal Register, and providing that increased imports shall be considered as cause or threat of serious injury to a domestic producer of like or directly competitive products when Tariff Commission finds that such increased imports have contributed materially to serious injury or threat thereof to such industry; Malone amendment limiting life of extension to June 30, 1956, instead of 1958; and Malone amendment limiting scope of trade agreements to those with nations in Western Hemisphere.

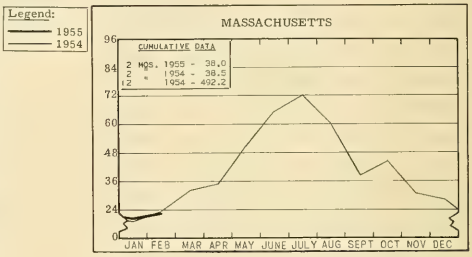
Senate insisted on its amendments to the bill, requested conference with House, and appointed conferees.

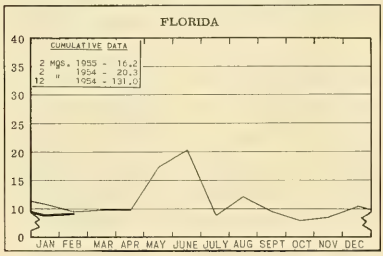
The House on May 5 disagreed to Senate amendments to H. R. 1, and agreed to a conference requested by the Senate. Conferees were appointed.

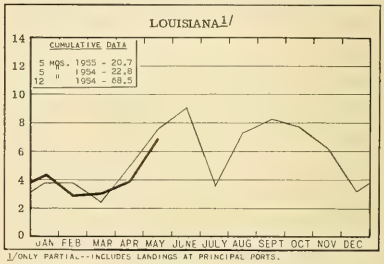
CHART 1 - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

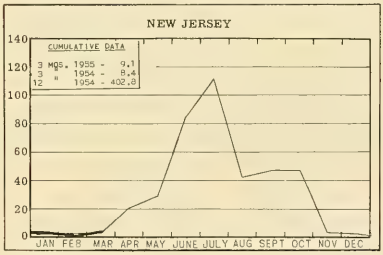


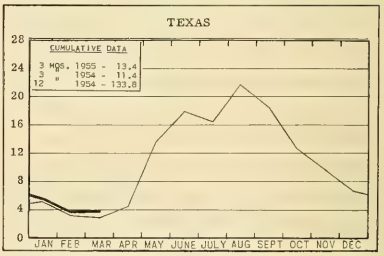


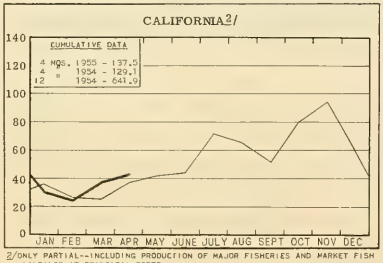


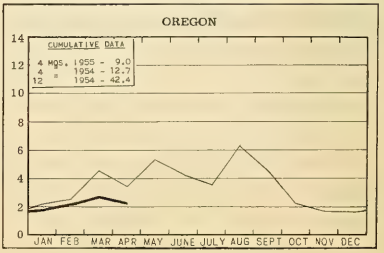


1/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.





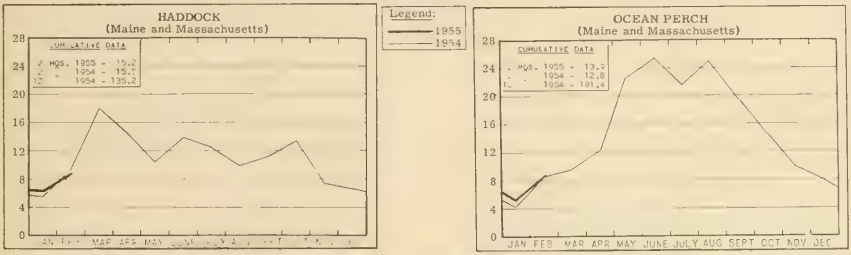




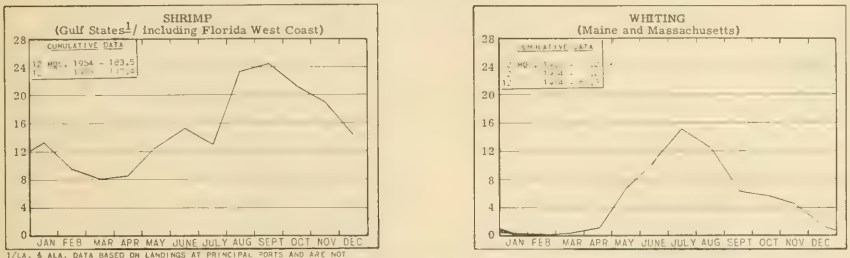
2/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

CHART 2 - LANDINGS for SELECTED FISHERIES

In Millions of Pounds

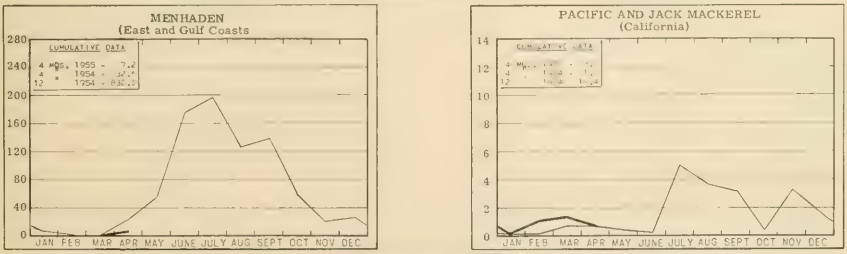


In Millions of Pounds

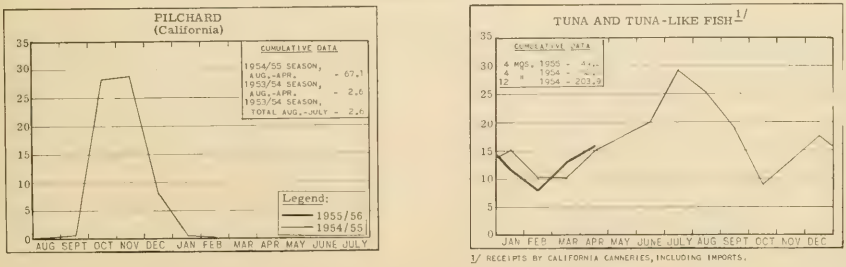


1/ LA., S. ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

In Thousands of Tons



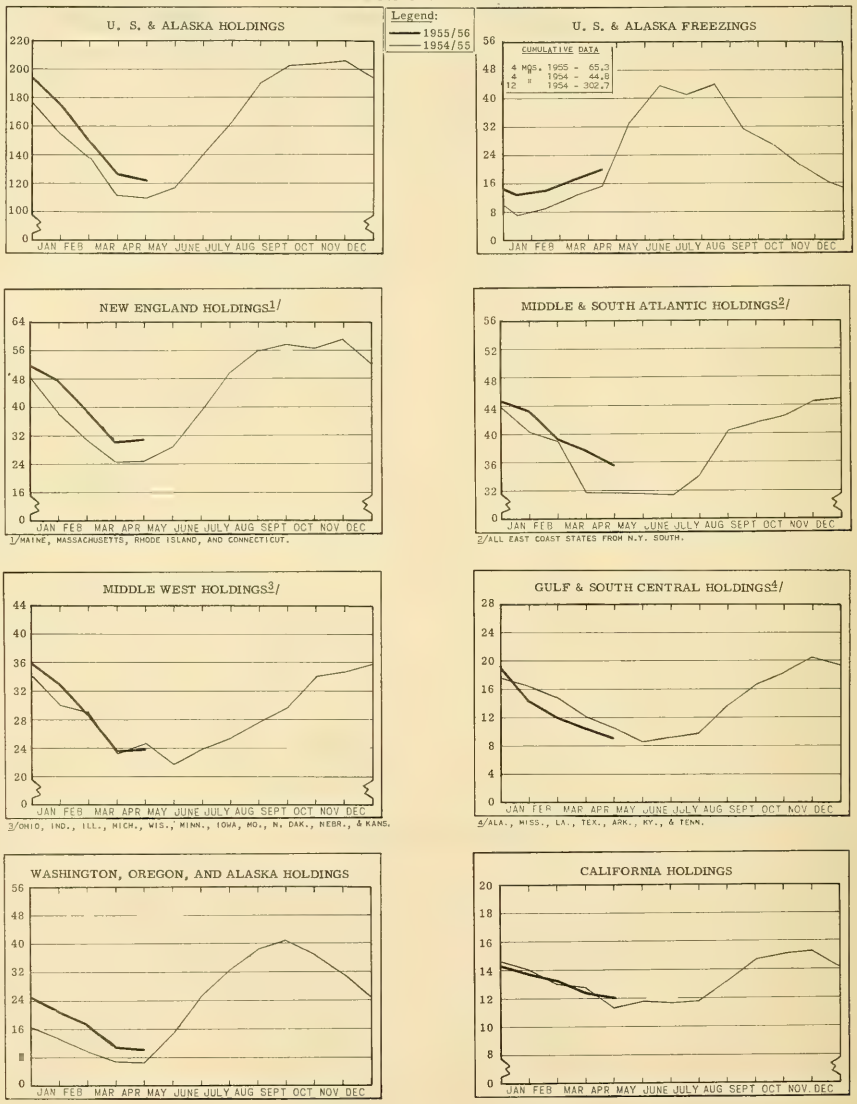
In Thousands of Tons



1/ RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds



1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR., & KANS.

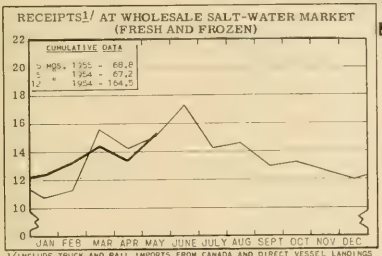
4/ALA., MISS., LA., TEX., ARK., KY., & TENN.

*Excludes salted, cured, and smoked products.

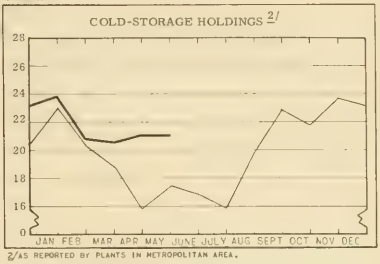
CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pound

NEW YORK CITY

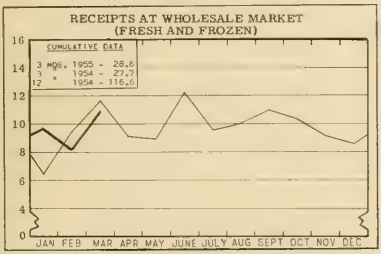


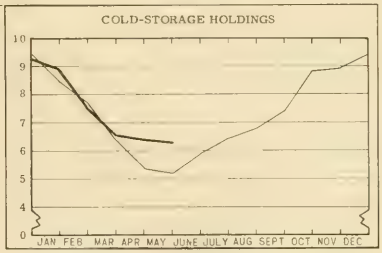
1/ INCLUDE TRUCK AND RAIL IMPORTS FROM CANADA AND DIRECT VESSEL LANDINGS AT NEW YORK CITY.



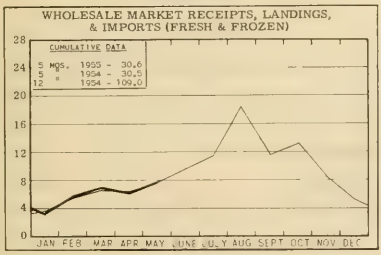
2/ AS REPORTED BY PLANTS IN METROPOLITAN AREA.

CHICAGO

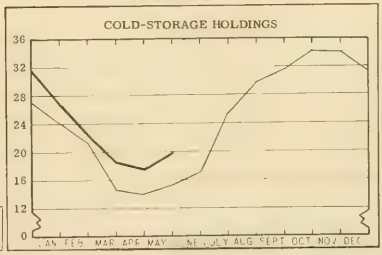




SEATTLE

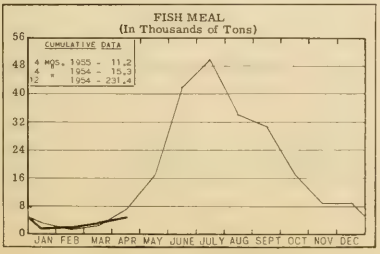


BOSTON



Legend:
1955
1954

CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA



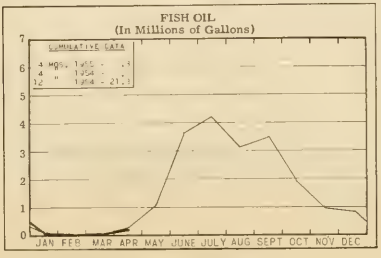
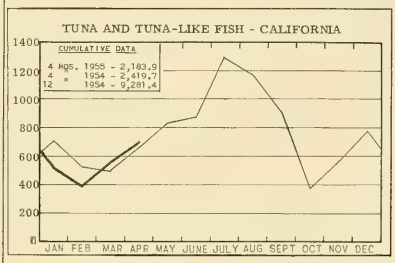
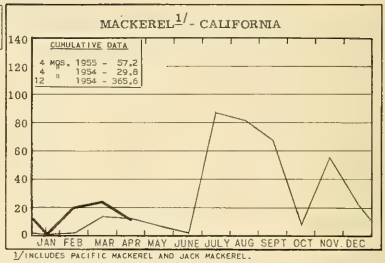


CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

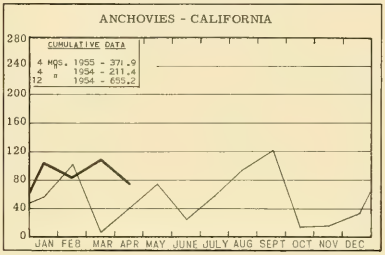
In Thousands of Standard Cases

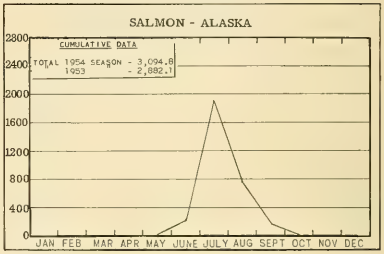


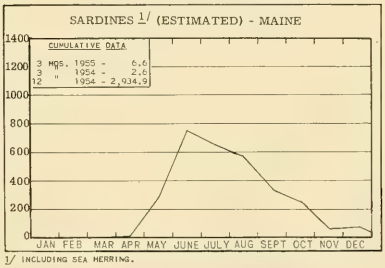
Legend:
1955
1954



1/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



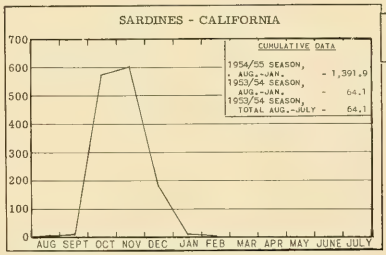




1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	$\frac{1}{4}$ drawn	$3\frac{1}{4}$ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. $\frac{1}{2}$ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	$\frac{1}{2}$ lb.	8 oz.



Legend:
1955/56
1954/55

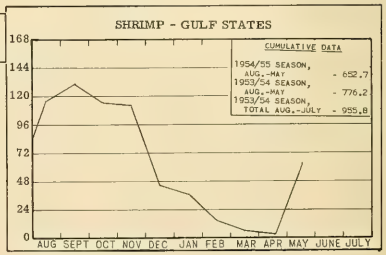
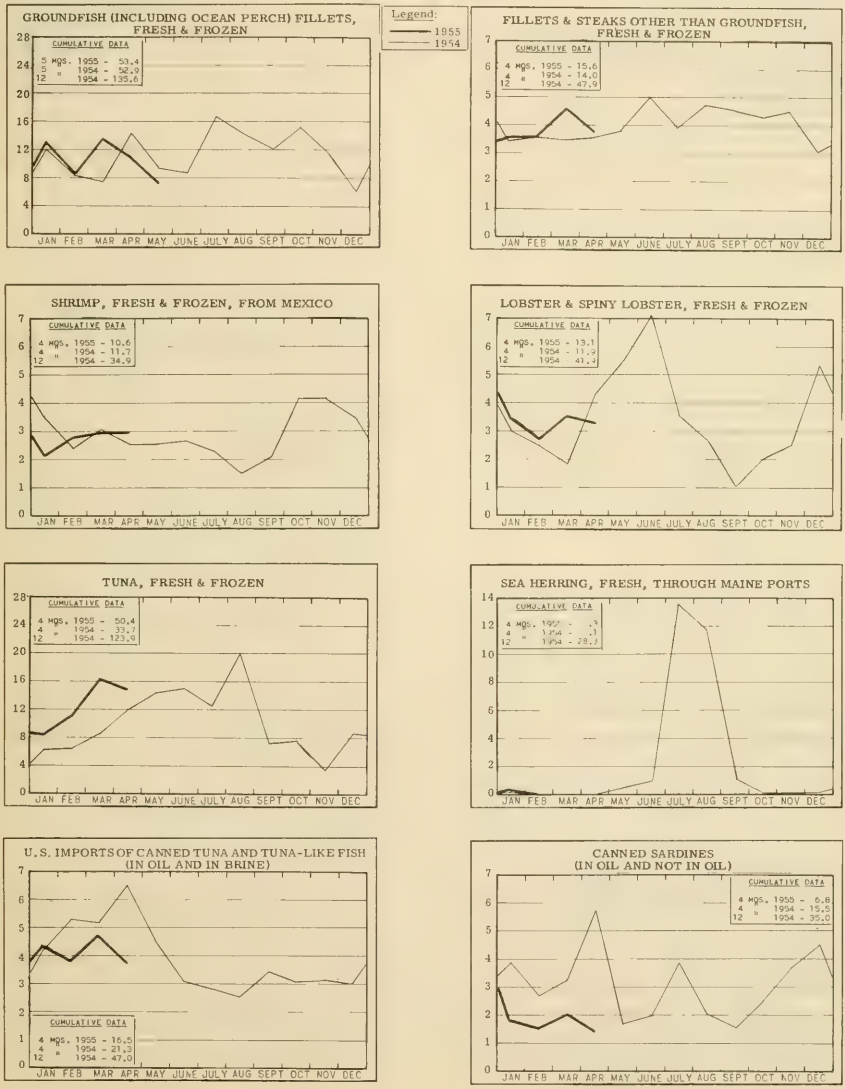


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

In Millions of Pounds



FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
FL. - FISHERY LEAFLETS.
SEP. - SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1085 - Frozen Fish Report, Annual 1954, 14 pp.
CFS-1091 - Florida Landings, December 1954, 6 pp.
CFS-1107 - Massachusetts Landings, December 1954, 8 pp.
CFS-1110 - Rhode Island Landings, November 1954, 4 pp.
CFS-1111 - Rhode Island Landings, December 1954, 4 pp.
CFS-1115 - Frozen Fish Report, February 1955, 8 pp.
CFS-1120 - Rhode Island Landings, January 1955, 4 pp.
CFS-1121 - Fish Meal and Oil, February 1955, 2 pp.
CFS-1123 - Texas Landings, February 1955, 3 pp.
CFS-1124 - Mississippi Landings, December 1954, 2 pp.
CFS-1125 - Mississippi Landings, January 1955, 2 pp.
CFS-1127 - Canned Fish & Byproducts, 1954 Annual Summary, 20 pp.
CFS-1129 - Packaged Fish, 1954 Annual Summary, 4 pp.
CFS-1130 - Rhode Island Landings, February 1955, 4 pp.
CFS-1131 - Maine Landings, February 1955, 4 pp.
FL -336x - Quarterly Outlook for Marketing Fishery Products, April-June 1955, 32 pp.
FL -190 - Turtle Trapping, by Branch of Gamefish and Hatcheries, 8 pp., illus., processed, August 1951.

Sep. No. 400 - The Pound-Net Fishery in Virginia--Part 1 - History, Gear Description, and Catch.
Sep. No. 401 - Determination of Oil in Fish Meal.

THE FOLLOWING SERVICE PUBLICATION IS AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED:

Production of Fishery Products in Selected Areas of Virginia, Maryland, and North Carolina (As Reported to Hampton Fishery Market News Office), 1953, by Lester A. Keilman, 18 pp., processed, April 1955. (Available free from the Market News Service, U. S. Fish and Wildlife Service, 18 South King St., Hampton, Va.) An analysis of the production of fish and shellfish in selected areas of Virginia, Maryland, and North Carolina during 1953 is presented in the first part of this report. The author discusses landings in the areas covered, production of the principal species: scup or porgy, sea bass, croaker, sea trout, spot, shad, oysters, crab meat, and shrimp. Information on the menhaden fishery is also presented--includes receipts reported by Virginia and North Carolina fish meal and oil plants by months for 1953 and 1952. Statistical tables make up the second part of the report--show production of fish and shellfish species for each area by months, shrimp landings in selected North Carolina ports by months, and total production by species for all areas covered. The areas covered in this report include: Atlantic, Beaufort, and Morehead City, N. C.; Norfolk, Portsmouth, Messick, Poquoson, Seaford, Yorktown, Newport News, Hampton, Lancaster County, Cape Charles, Oyster, Willis Wharf, and Wachapregue, Va.; Ocean City, Cambridge, and Crisfield, Md. In addition, shrimp landings are reported for Beaufort, Morehead City, Pamlico County, Atlantic, and Southport, N. C.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

Arsberetning fra Fiskeriministeriets Forsogslaboratorium for 1954 (Annual Report to the Danish Fishing Industry), 32 pp., illus., printed, in Danish with English translation of the main experimental results. Fiskeriministeriets Forsogslaboratorium, Kobenhavn, Denmark, 1955. Describes the results of the following experiments: fat determination in herring and sand eels; determination of the nutritional value of fish for fur-animal feed; chilling of fish; cooling rate during icing; icing with "sea water" ice; combination of icing and chemical preservation of fish; smoked salmon substitutes; freezing shrimp; freezing gar-pike; frozen fish fillets; packaging frozen fillets; bacteriological investigations; keeping quality of gaffelbidder and other similar products; effect of various acids in sauces; new recipes for gaffelbidder sauce; cav-

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iar; calculation of autoclave timing; research on cans; and fish silage.

(Canada) Fisheries Statistics of British Columbia, 1954, 10 pp., illus., processed. Canadian Department of Fisheries, Vancouver, B. C., April 7, 1955. A summary of fisheries statistics of British Columbia containing graphs and tables covering quantities and value of the most important species of fish for 1954; landed and marketed value of fish and fishery products for 1940-54; landings and manufactured products marketed in British Columbia for 1954; salmon pack; inventory of boats (10 tons and over) 1954; inventory of boats (less than 10 tons) 1954; quantity and value of gear used in the primary fisheries, 1954.

Canada's Atlantic Salmon, by F. H. Wooding, 23 pp., illus., printed, 25 Canadian cents. (Also in Canadian Geographical Journal, October 1954.) Department of Fisheries, Ottawa, Canada, November 1954. The purpose of this booklet is to tell as clearly as possible as much of the Atlantic salmon story as is known so that the public will understand and support the conservation measures for the protection of this valuable resource. This beautifully illustrated booklet describes the early history of the Atlantic salmon, its life cycle, the commercial fishery, the sports fishery, and the future of the resource.

Farm Fish Ponds in West Virginia, by R. Franklin Dugan, Circular 84, 35 pp., illus., printed. West Virginia University, Agricultural Experiment Station, College of Agriculture, Forestry, and Home Economics, Morgantown, W. Va., April 1952. Farm fish ponds have found a permanent place in the agriculture of West Virginia. There are now about 3,000 farm ponds in the State. They make up about 1,200 acres of water surface. Most of them have been built during the last 10 years and new ones are being constructed each year. Nearly all of these ponds are suited to the production of fish. Since impounded water can be made far more productive than natural streams, the ponds represent a significant addition to both food and sport in West Virginia. A poorly-managed pond, however, will yield only a small fraction of the fish that can be produced under proper management. The purpose of this circular is to aid present and future pond owners increase the value and productivity of their ponds by use of a few simple techniques that have been tested under West Virginia conditions and found to give good results.

Fishing Boats of the World, edited by Jan-Olof Traung, 579 pp., illus., printed, $12.50. Published by The Fishing News, Arthur J. Heighway Publications Ltd., Ludgate House, Fleet Street, London, E. C. 4, England, 1955. This comprehensive volume, published in cooperation with the Food and Agriculture Organization of the United Nations, contains material from 70 papers which were presented at the FAO International Fishing Boat Congress held in Paris and Miami in 1953. In addition to the papers, which are amply illustrated, there is included a discussion of each section by the experts who attended one or both sessions of the Congress. A table of contents and subject index adds to the reference value. Subjects cover the entire field of fishing-vessel design, construction, outfitting, operation and maintenance, divided into four main parts (1) Boat Types, (2) Naval Architecture, (3) Engineering, and (4) Factoryships. Over 600 illustrations of vessels from Norway to Bombay and ranging in size from small beach landing craft to large factoryships and whale catchers are included. Research vessels, trawlers, tank-testing techniques, safety at sea, Diesel versus semi-Diesel or steam engines, propellers, deck gear, freezing-fish-at-sea, floating canneries, and numerous other aspects of vessel construction and operation are discussed. The book contains a wealth of data in tabular and illustrative form on nearly every major type of fishing craft. Papers present the viewpoints of owners, operators, designers, engineers, and and fishery researchers. In the discussions the reader will find many conflicting statements and opinions, reflecting the controversial and stimulating nature of meetings which bring together experts from all parts of the globe. Of unquestionable value is the fact that the book presents up-to-date material. It is not all-inclusive in its coverage of the subject and is not intended as a textbook on naval architecture. Probably its greatest value will be as a ready reference source for almost any phase of fishing vessel construction and operation. The list of contributors and the references cited will be especially useful to students and researchers.

--D. E. Powell

Food and Game Fishes of the Texas Coast, by Patricia Pew and the Staff of the Marine Laboratory, Bulletin No. 33, Series No. IV, Marine Laboratory, 68 pp., illus., printed. Texas Game and Fish Commission, Austin, Texas, November 1954. This bulletin, the fourth of an educational series, makes available information on the marine food and game fishes of Texas. In general, Texas marine fishes may be divided into three groups. The first is the littoral fishes such as trout, red drum (redfish), and drum which inhabit the bays and near-shore waters of the Gulf. The second group is made up of fish inhabiting the open waters of the Gulf, and includes Spanish mackerel, cero, sailfish, and other similar fishes. These are known as pelagic fishes. The third is composed of reef fishes, like red snapper, the groupers, and jewfishes. This bulletin describes the food of animals in the sea and illustrates a typical food cycle. It describes methods of identifying a fish and shows a diagram with terms used to designate the anatomical parts of a fish. In the descriptions of the various fish are listed both the scientific and some of the common names of each fish, together with the range, size, habits and food, color, and uses.

(India) Annual Administration Report of the Department of Fisheries, Bombay State, for the Year 1953-54, 64 pp., illus., printed. Government Book Depot, Charni Road Gardens, Bombay 4,

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India, 1954. Reports on the marine fisheries, fish-curing yards, fisheries schools, socio-economic work, fresh-water fisheries, and technological studies. Statistics are also included on the different varieties and quantities of fish landed in 1953/54.

"Man and the Columbia's Salmon," by Anthony Netboy, article, Nature Magazine, vol. 48, no. 1, January 1955, pp. 34-37, 52, illus., printed. The American Nature Association, 1214 16th St. NW., Washington 6, D. C.

(New York) Forty-Third Annual Report of the Conservation Department of the State of New York for the Year 1953, Legislative Document (1954) No. 47, 382 pp., illus., printed. New York State Conservation Department, Albany, N. Y. This report gives details of the accomplishments of all branches of the Conservation Department during 1953, which includes the Division of Fish and Game. This Division manages the wildlife resources of the State. It includes a discussion of pollution investigations, and a section on fish culture. A section on inland fisheries includes discussions of the commercial fisheries for 1952 in the Hudson River, Lake Erie, and Lake Ontario; and carp and other coarse fish. A section on marine fisheries gives statistics of shellfish lands and various licenses, and statistics of unlicensed fishing vessels by gear for the year 1952. The Division of Fish and Game enforces all laws relating to fish and game through a game protective force of 189 men in the field; it issues all hunting, trapping, and fishing licenses, including those for commercial fisheries and shellfisheries; it operates 23 game management areas; manages 811 miles of public fishing streams in addition to the waters on State-owned lands in the Adirondack and Catskill Forest Preserves; operates 20 fish hatcheries and 6 game farms for the production of fish and game for stocking in the State; carries on necessary fish and wildlife research; and conducts an expanding habitat and stream improvement program. The Division also administers cooperative Federal Aid programs for wildlife under the Pittman-Robertson Act, and for fisheries under the Dingell-Johnson Act.

Notices Regarding Negotiations with Switzerland (Supplemental Notices Regarding Negotiations Involving Japan Initially Announced in November 1954), 22 pp., processed. Interdepartmental Trade Agreements Organization, U. S. Tariff Commission Building, Washington 25, D. C.

"Observations on the Incidence of Dermocystidium marinum Infection in Oysters of Apalachicola Bay, Florida," by C. E. Dawson, article, The Texas Journal of Science, vol. VII, no. 1, March 1955, pp. 47-56, illus., printed, single copies $1.25. Texas Academy of Science, University Station, Austin, Tex.

The Occurrence of Oily Pilchards in New South Wales Waters, by M. Blackburn and R. Downie, Division of Fisheries Technical Paper No. 3, 11 pp., illus., printed. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1955. Efforts were made to check a hypothesis that pilchards are abundant below the surface and sufficiently fat to be profitably reduced into oil and fish meal in the summer months on the coast of New South Wales. Results obtained in January 1954 in the Port Stephens-Newcastle area were highly satisfactory. Although shoals were not seen at the surface they were readily detected in abundance by echo-sounding, and all samples taken by drift net consisted of fat fish. Oil content ranged from 11 to 17 percent by weight of raw fish (compared with 5 percent or less in the same region in winter), which would permit profitable reduction if sufficiently large and regular catches could be made.

(Ohio) Report of the Director of the Ohio Department of Natural Resources (for the fiscal year ending June 30, 1953), 261 pp., illus., printed. Ohio Department of Natural Resources, Ohio Departments Building, Columbus 15, Ohio. This publication contains the annual reports of the various divisions of the Ohio Department of Natural Resources for 1952/53. The Division of Wildlife report discusses, among other items, the work of the Fish Management Section which is divided into four phases: (1) improvements for better fishing; (2) management; (3) inventories to keep abreast of current conditions; and (4) fact finding. It also contains a brief discussion of commercial fishing in Ohio waters of Lake Erie.

Public Notice of Investigations and Hearings, under Section 3 of the Trade Agreements Act of 1951, as Amended, and Section 332 of the Tariff Act of 1930, as follows: Investigation No. 2--Supplement A - Proposed Trade Agreement Negotiations with Japan and Other Countries; and Investigation No. 3--Proposed Trade Agreement Negotiations with Switzerland; 15 pp., processed. United States Tariff Commission, Washington 25, D. C., February 21, 1955.

Records of Fishes in the John N. Lowe Collection from the Upper Peninsula of Michigan, by William Ralph Taylor, Miscellaneous Publications No. 87, 52 pp., illus., printed. Museum of Zoology, University of Michigan, Ann Arbor, Mich., November 9, 1954.

Report on Preliminary Studies of Pollution in Biscayne Bay to Federal Security Agency, Public Health Service, National Institute of Health (Under Grant E-510), by Hilary B. Moore, Ilmo Hela, Ernest S. Reynolds, J. Kneeland McNulty, Sigmund Miller, and Clarence A. Carpenter, Jr., Progress Report 55-3, 81 pp., illus., processed. The Marine Laboratory, University of Miami, Coral Gables, Fla., January 1955.

Tariff Simplification Study (Interim Report To The President And To The Chairmen Of The Committee On Finance Of The Senate And Of The Committee On Ways And Means Of The House Pursuant To Section 101(d) Of The Customs Simplification Act Of 1954), 74 pp., processed. U. S. Tariff Commission, Washington 25, D. C. March 15, 1955.

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Immediately after the approval of the Customs Simplification Act of 1954, the Tariff Commission initiated the study provided for in section 101 thereof and gave wide distribution to a release inviting importers, domestic producers, customs brokers, and other interested parties to submit any suggestions which in their opinion were pertinent to the purposes of the study. The suggestions which have been received are being analyzed, but treatment at length with specific suggestions is not undertaken in the interim report. The report is confined to a treatment of the more fundamental problems underlying a simplification of the tariff schedules, the principles to be followed by the Commission in formulating the proposed revision of the tariff schedules, and methods for putting the proposed revision into force and effect.

Ten Years of United Nations Publications, 1945 to 1955, issued by the United Nations Department of Public Information, 271 pp., printed. Obtainable from all UN sales agents at 50 U. S. cents a copy (2s. sterling, 1.20 Swiss francs) or equivalent in other currency. United States agents: International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N.Y. This is a special reference volume describing all United Nations publications which have appeared since 1945 to help mark the tenth anniversary of the opening of the San Francisco conference which drafted the UN Charter. It catalogues and briefly describes all UN publications and official records made available to the public over the last ten years. Its 2,252 publications range in price from the 10-cent (U.S) pocket edition of the United Nations Charter to the Yearbook of the United Nations at US$12.50. These are among the 108 general publications issued by the Department of Public Information to report the work of the United Nations.

Sixteen other categories of specialized studies and reports describe 232 titles in the field of economics, trade, finance, and statistics (including economy of Europe, Latin America, Asia and the Far East, and technical assistance); 97 titles dealing with social questions; 136 in the international law and treaty series; 33 demographic studies; and 27 studies on trusteeship and non-self-governing territories. Other categories include transportation.

Also included are all official records of the United Nations which can be purchased in final printed form by the public; information concerning League of Nations publications; documents of the San Francisco Conference and the London meetings of the UN Preparatory Commission; mimeographed documents; visual material; and special information services relating to films, radio, and television. The publications of the specialized agencies are not included.

Thirteenth Annual Meeting of the Atlantic States Marine Fisheries Commission, Part I, 72 pp., illus., processed, limited distribution. Atlantic States Marine Fisheries Commission, Mt. Vernon, N. Y. Part I presents the minutes of three general sessions; joint meeting of the North Atlantic and South Atlantic Sections; section meetings of the North Atlantic, Middle Atlantic, Chesapeake Bay, and South Atlantic Sections; report of the Secretary-Treasurer; and report of the Auditor. Part II, 146 pp., is bound separately and contains legal, biological, and technological appendices.

Tide Tables, East Coast, North and South America (including Greenland) for the Year 1956, Serial No. 780, 276 pp., illus., printed, 50 cents. Coast and Geodetic Survey, U. S. Department of Commerce, Washington 25, D. C.

(Union of South Africa) Twenty-fourth Annual Report of the Division of Fisheries, Department of Commerce and Industries (For the Period 1st January, 1952--31st March, 1953), by Dr. J. M. Marchand, 199 pp., printed. (Reprint from Commerce & Industry, September 1954.) The Government Printer, Pretoria, South Africa, 1954. A review of the deep-sea and inshore fisheries of South Africa, with special reference to trawling; whaling; and the pilchard, rock lobster, and line fisheries. Contains also chapters on research at sea and ashore, fishing harbors, and the pilchard research program.

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Alma Greene, and Helen Joswick

* * * * *

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United States Clarifies "Fair Value"

New regulations recently issued by the U.S. Treasury define more carefully "fair value" as applied to imported merchandise when the question of dumping is at stake.

R. G. C. SMITH, *Commercial Counsellor, Washington.*

FOR SOME TIME uncertainty has prevailed over the correct definition of "fair value" when it is used to ascertain whether or not the price at which goods are offered for sale in the United States is below the value of the goods in the country of origin—and therefore constitutes dumping. In general, the tendency has been to accept the value used for customs appraisal, although this value might be considerably higher than the actual sale price to the United States, and to consider that this does not constitute dumping in the usually accepted definition of that term. Furthermore, it had become apparent that the existing regulations were intricate, time-consuming, and often gave a misleading price comparison.

To clarify this issue, the Treasury first took administrative action in June of 1954 and published proposed amendments to the regulations, inviting comments and suggestions for improvements from industry and from traders. As a result of the replies received, the Treasury last November issued proposed amendments. But before adopting the changes, it again invited comment. Regulations have now been issued that are substantially the same as those published in November.

Methods of Determining Values

The new regulations are important because they clarify the methods of establishing whether or not dumping is taking place and also remove some of the anomalies of the previous methods of assessing values when considering anti-dumping action. The amendment clearly defines fair value as applied to imported merchandise and goes on to illustrate the application of the definition by giving a number of examples.

The usual test for determining dumping will be whether or not imported goods are sold at prices less than the fair value. The fair value is defined as the price at which the goods are sold for consumption in the country of origin on or about the time of purchase. Where this cannot be established, or if the sales in the home market are of little significance, other critera are used. These are, in order of consideration:

- Prices charged on exports to other countries.
- Prices of other foreign producers or sellers in the same country.
- Cost of production.

What is particularly significant about the new regulations is that in calculating fair value various considerations may be taken into account. Reasonable allowance, for instance, may be made for differences in quantities and circumstances of sale. Furthermore, if no actual sales take place in the home market, offering prices may be accepted. Should sales prices otherwise vary, the established fair value will take into account the price at which the preponderance of the merchandise is sold, weighted average of prices, or other reasonable critera.

Some Examples

This means that, should a foreign firm have a domestic price structure that provides for prices that differ according to the class of customer, it may apply the same pricing policy to its exports to the United States without danger of running foul of the anti-dumping laws. In general, the amendments make it possible for foreign firms to deal in the United States market using the same pricing policies as they use on the home market. Or they may even offer lower prices for export if there are conventional and satisfactory reasons for doing so—such as greater volume per individual sale than is customary on the home market. The amendments also make it possible to apply export prices (without danger of anti-dumping action) to their sales in the United States, even if these prices are lower than the domestic price—as long as sales in the domestic market are relatively small in relation to total sales (i.e., domestic plus all exports).

It should be emphasized that these important changes and clarification of valuation for anti-dumping purposes in no way alter or affect the valuation for duty purposes. The procedure for calculating values for assessment of duties remains unchanged and there may be wide divergence between the values used for each purpose. As the Treasury forecast on several occasions, a bill was introduced into Congress on May 6, 1955, designed to amend the methods of arriving at value for duty purposes. It remains to be seen, however, whether this bill will pass both Houses of Congress. In the past, similar bills have been introduced and have failed to pass the Senate. ●

JUNE 11, 1955 --(Canada) Foreign Trade, June 11, 1955.

CONTENTS, CONTINUED

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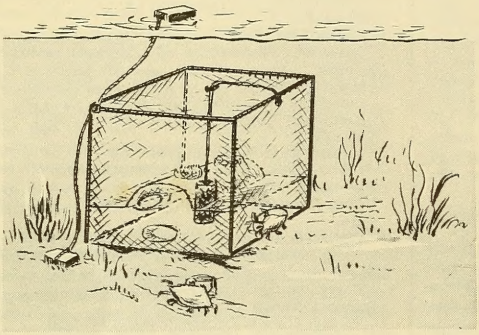
THE CHESAPEAKE BAY CRAB INDUSTRY

The Chesapeake Bay Crab Industry, Fishery Leaflet 358 (Revised), brings up-to-date the story of the crab industry of Chesapeake Bay. It describes the various types of gear used in capturing the crabs; and the methods used in marketing, picking, and processing.

The 4,000 square miles of the Chesapeake Bay and tidal tributaries, from the James River to Pocomoke Sound and beyond, form one of the great blue-crab nurseries of the world. Here the blue crab (Callinectes sapidus) feeds, breeds, and matures, providing a highly marketable commodity for thousands of Maryland and Virginia crabbers, and a highly palatable food for Americans.

Whole blue crabs appear in the market in two principal forms, hard and soft. The hard crab contains delicious meat, but for the uninitiated it is difficult to extract. Therefore, it is usually sold picked out and graded in 1-pound containers, prepared in shore plants by professional pickers. The soft crab, as its name implies, is free from the hard shell. It is shipped alive in special protective packing. A third form may be mentioned in passing, "peelers." These are hard crabs preparing to molt, or shed their shells in course of growth. In commercial records they are classed with soft crabs. They are used by hook-and-line fishermen for bait.



Crab Pot. Invented in 1938, the crab pot now produces the bulk of the blue-crab catch in the Chesapeake Bay. An estimated 85,000 pots were operated in the Bay during 1952.

The perishability of crab meat has long been a problem of the industry. Most freezing and holding techniques fall short of preserving quality intact. In 1951 a patent was granted to a Maryland packer for what might be called a pasteurization process. Under it crab meat has been successfully held in cold storage for comparatively long periods. When improved preservation methods become general the industry may achieve the stability it sorely needs. Under present conditions crabs that sell for $3, or less, per 100-pound barrel in July may bring $20, or more, in February.

A recent count lists about 200 firms in the Chesapeake area, whose operations range from a two-man outfit shipping perhaps 10,000 soft crabs a season, up to picking houses producing 100,000 pounds of meat during the calendar year. The total gross income of the enterprises will hover around $6 million during a fair year.

Ordinarily about 4,000 persons find seasonal employment in catching and transporting crabs in the Chesapeake area. Processing and handling furnish occupation to about 1,000 more, most of them the year round.

Predicating no greater natural supply than is available in a normal year, the industry would be capable of considerable growth if practical means could be devised (1) to apply mass-production techniques to processing and (2) to combat more successfully the extreme perishability of the crabs themselves. These problems are under constant study by State and Federal agencies.

Free copies of Fishery Leaflet 358 are available from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.